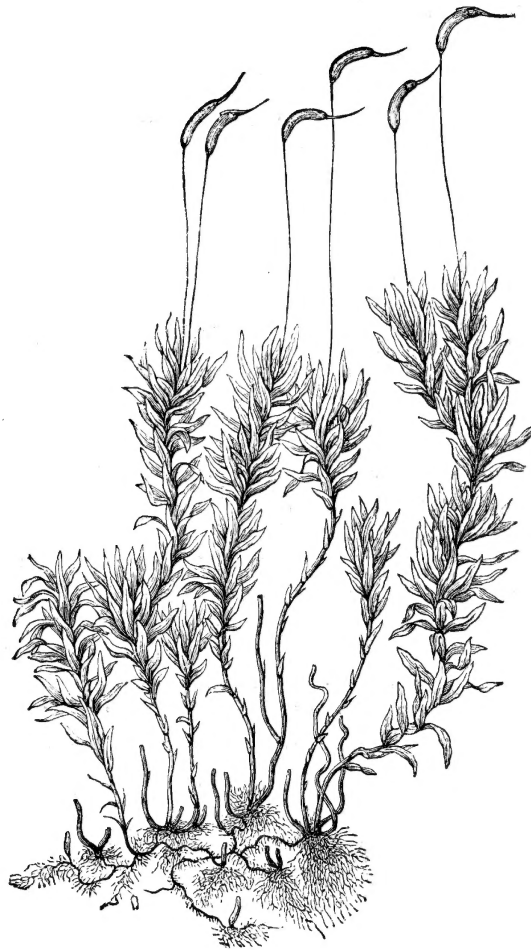


BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA



Atrichum undulatum (Hedw.) P. Beauv.

162 species of mosses of the Piedmont of Virginia are the subject of this special issue

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Common and Occasional Bryophytes of the Virginia Piedmont

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INTRODUCTION¹

With the publication of “Liverworts and hornworts of the Virginia Piedmont” (*Banisteria* 8: 3-28), Dr. David Breil brought to fruition (in part) his years of study of the bryophytes of this central region of Virginia. His stated purpose in the earlier publication is continued here, that is, “to write an illustrated guide to the regional species of these too often ignored plants,” and “to make the citizens of this pygmy plant world understandable and accessible to naturalists who may have been discouraged from their study by the lack of a means of identification” (Breil, 1996).

¹ Prior to his death on March 3, 1997, Dr. David Breil had completed the substance of a manuscript on mosses of the Virginia Piedmont. Illustrations had been contracted to Susan A. Williams of Rowe, Massachusetts, and were approaching completion. As the only resident bryologist in Virginia, Dr. Breil’s work filled a void not only in subject matter, but in its geographic coverage as well. The body of the manuscript is reproduced here essentially without change to preserve Dr. Breil’s taxonomic concepts (minor changes are noted in the manuscript). Dr. Jonathan Shaw of Duke University recommended a few places where a better name might be used. Accessory portions of this paper (Introduction, Glossary, Literature Cited, Checklist, and Plates) were compiled by Thomas F. Wieboldt of Virginia Tech, to provide a similarly formatted companion paper to Dr. Breil’s “Liverworts and hornworts of the Virginia Piedmont”. The Introduction borrows heavily from the earlier paper but is adapted and expanded to address mosses rather than liverworts and hornworts. Definitions in the glossary are adapted slightly from *Glossarium Polyglottum Bryologiae* on the Missouri Botanical Garden’s bryology website. Plates were assembled digitally by Thomas F. Wieboldt.

Despite the moss flora being larger, 158 species, compared with the 67 liverworts and hornworts (hepatics), the level of detail and coverage is similar. To bring this work into an historical perspective, a brief review of bryophyte exploration in Virginia follows.

The bryophyte flora of Virginia is imperfectly known as evidenced by the relatively few publications on Virginia mosses. Little attention was paid to Virginia until the end of the 19th century (Patterson, 1949). An excellent synopsis of early bryological exploration is given by Anderson & Zander (1973), a few highlights of which are reiterated here. The earliest moss collections from Virginia were probably those of John Banister who sent specimens to John Ray in England. Ray published descriptions of Banister’s plants in two publications (Ray, 1686, 1690). The classic work *Historia Muscorum* by Dillenius (1741) acknowledged receiving plants from John Bartram, John Clayton, and John Mitchell. A study of Bartram’s mosses listed 18 of 55 species as being from Virginia (Buck & McLean, 1985), but Bartram traveled through Virginia only briefly. By comparison, Clayton and Mitchell were residents. All 32 mosses listed (as polynomials) by Gronovius in *Flora Virginica* (1762) are credited to Clayton. These were subsequently studied by Patterson (1965), who determined them according to the binomial system. Mitchell, who resided on the Rappahannock River, sent specimens to Dillenius. It was customary to publish only new species, so the number of specimens actually collected by these early botanists is unknown.

Mention of Virginia bryophytes is almost completely lacking for the next century as most plant collectors merely traversed the state enroute westward or to the higher mountains to the south. Such was the case of Asa Gray accompanied by the well-known bryologist William S. Sullivant, who traveled through the mountains of southwestern Virginia in 1845 (Sullivant, 1846). Specific place names were given in

only a few instances, so it is not possible to attribute collections specifically to Virginia in many cases (Patterson, 1949). In 1892, John K. Small and Anna Vail made the first extensive collection of bryophytes in the state in the vicinity of Marion (Small & Vail, 1893). Neither was a bryologist but their numerous collections were identified by Elizabeth Britton whose list of 158 species comprises a significant portion of the report. Britton also assisted Thomas Kearney who included 34 mosses in his botanical survey of the Dismal Swamp region of southeastern Virginia (Kearney, 1901).

During the 1930s and 1940s, M.L. Fernald made nearly annual forays to southeastern Virginia to study the vascular flora. He was accompanied by Bayard Long, who collected 121 specimens of bryophytes, four of which were new to the known flora of Virginia (Patterson, 1951). The eminent bryologist Aaron J. Sharp of the University of Tennessee was the first of several bryologists to conduct field courses in bryology at the Mountain Lake Biological Station. Others to follow him were Paul M. Patterson, Rudolph M. Schuster, David A. Breil, and Susan Studlar. Patterson published several papers compiling the results of his and others' studies (Patterson, 1940a, 1940b, 1943, 1944) which brought to 216 the total number of mosses reported for Giles County, the only reasonably well-studied region in Virginia.

During 1944, the bryophyte flora of Shenandoah National Park was studied by Irma Schnoberger and Frances Wynne (1944) who reported 171 mosses for this relatively large and diverse area. Over a period of several years in the late 1940s, Hugh Iltis made some 400 bryophyte collections in the vicinity of Fredericksburg, comprising parts of Spotsylvania, Caroline, King George, and Stafford counties. Among the 109 mosses reported (Iltis, 1950), nine were recorded for the first time in Virginia. During the summers of 1949 and 1950, Bernard Mikula made about 600 bryophyte collections from 36 counties throughout the state, though mostly from the southeastern Coastal Plain. His specimens, housed at the Ozarks Regional Herbarium at Southwest Missouri State University, tallied 113 species and varieties, the more unusual of which were reported by Patterson (1953).

Over a period of years, Patterson studied over 3,000 unreported collections made mostly by personnel associated with various colleges and universities, as well as the U.S. National Herbarium. These and his own collections (which numbered over 1,500 in 1953-1954 alone) covered much of the state

and resulted in numerous noteworthy records as well as 41 new state records which he published in his *Bryophytes of Virginia* series (Patterson, 1950, 1955). This brought the total number of mosses known to occur in Virginia to 365 species, yet he points out that the Piedmont is poorly represented (Patterson, 1950).

In the more recent past, Douglas Ogle has collected widely and from diverse habitats across most of southwestern Virginia. His collections were almost entirely determined by David Breil and are now housed at VPI. Between 1989 and 1991, Christopher Clappitt made a concerted effort to insure that the sphagnum mosses were better known, and made hundreds of collections from across the state. All of his collections were determined authoritatively by Lewis Anderson of Duke University to give us a solid foundation for this interesting but complex group.

Following his arrival at Longwood College in 1968 and continuing until his death in 1997, David Breil collected bryophytes throughout Virginia with primary emphasis on the central and southern Piedmont. This accumulated material, now part of the cryptogamic herbarium at Duke University, forms the basis for the following treatment.

THE VIRGINIA PIEDMONT

The Piedmont physiographic province extends in a NE - SW direction throughout the length of Virginia and is about 60 miles (96 km) wide at the northern end, broadening to about 120 miles (192 km) wide along the North Carolina border. The eastern edge of the Piedmont is formed by the Fall Line (at 30 m elevation), a series of rapids occurring in rivers (James, Rappahannock, Potomac, Appomattox, and Roanoke) draining to the east. The western boundary of the Piedmont is marked by the base of the Blue Ridge Mountain escarpment, about 300 m elevation. The Piedmont is underlain by ancient crystalline rocks mainly covered by residual, red clay soils which are somewhat acidic (pH 5.0 - 6.0). The area is hilly, with elevational differences not usually exceeding 15 m. Occasional resistant ridges or monadnocks occur as solitary outliers of the Blue Ridge Mountains. Precipitation averages about 45 inches (114 cm) per year occurring throughout the year except during the drought season during late summer, usually August.

Braun (1950) described the outer Piedmont as occurring in the pine-oak region of the Eastern Deciduous Forest. Mature upland deciduous forests are composed of populations of oaks (white, red, post, Spanish, chestnut, scarlet), hickories (sweet pignut,

pignut, shagbark, mockernut), and mixtures of other hardwood species (red maple, sweetgum, tulip poplar, ironwood, beech, black gum, dogwood, sourwood), often with old successional pines scattered throughout. North slope forests are dominated by American beech with white oak, red or Florida maples, tulip poplars, and ironwood. Successional community stages range from old fields to conifer forests (loblolly pine, Virginia pine, red cedar), and some hardwood types (including sweetgum and tulip poplar). Wetland communities include small streams (with hazel alder, sycamore), rocky river shorelines, floodplain forests (with river birch, sycamore, willow oak, American elm, box elder), and grassland marshes. Most reservoirs, lakes, and ponds were created in the last hundred years but strongly influence the vegetation of this region. Microhabitats of soil hummocks, rock ledges, rocky ravines, logs, stumps, tree trunks, and roots are especially important to the mosses, with the greatest diversity always being found in the more moist shaded areas.

STUDY AREA

The Virginia Piedmont has been virtually unsurveyed for the presence of bryophytes prior to this study. The central and southern part of the Virginia Piedmont was utilized, from Louisa County in the northern part to the North Carolina border on the south. A buffer zone of about one Piedmont county to the east and west was maintained in order to diminish the direct influence of plants from the mountains and the Coastal Plain. The counties included in this study were Amelia, Appomattox, Buckingham, Campbell, Charlotte, Cumberland, Fluvanna, Goochland, Halifax, Louisa, Lunenburg, Mecklenburg, Nottoway, Pittsylvania, Powhatan, and Prince Edward (Figure 3).

BRYOPHYTE CHARACTERISTICS

Bryophytes consist of hornworts, liverworts, and mosses, all of which are small (normally less than 2 inches [5 cm] long) and have similar life cycles. A key to subdivisions will serve to distinguish these major groups. Mosses are small leafy plants which have leaves in more than three rows. Moss leaves are singly pointed, unlobed, and have a midrib (although it can be short and inconspicuous). Leafy liverworts may be confused with mosses but differ from them in leaf and sporophyte structure. Leafy liverworts have leaves in two or three distinct rows, each leaf possessing two or more lobes that lack midribs. In

both mosses and liverworts, the sporophyte grows epiphytically upon the gametophyte plant and is produced seasonally. Mosses usually develop persistent green to brown sporophytes with sporangia that are ovate, cylindrical, spherical, or oblong and allow the escape of spores through the release of a terminal cap. The sporophytes of liverworts are short-lived and produce black cylindrical or ovate sporangia (capsules) which split into four valves to release the spores.

ILLUSTRATIONS

One species in each genus is illustrated. Numbers correspond to the number of the genus in the text. The following conventions are used: abbreviations - br. = branch, c. = capsule, l. = leaf, p. = plant, sp. = sporophyte; scale lines - single = 1 mm, double = 0.5 mm.

KEY TO SUBDIVISIONS

- 1a. Plants with stem and leaves 2.
- 1b. Plants thallose, consisting of a flat, elongated, round, or heart-shaped body, sometimes branched (never with leaves) 3.
- 2a. Leaves singly pointed and/or possessing a single midrib; leaves attached spirally around stem (except *Fissidens*) **Mosses** (Musci)
- 2b. Leaves forming 2 or more lobes or conspicuous teeth at tips and lacking a central midrib, or formed of multicellular hairs; leaves occurring in 2 (sometimes 3) distinct rows on stem. **Liverworts** (Hepaticae)
- 3a. Sporophytes linear, horn-like; thallus with 1-2 large chloroplasts filling each cell **Hornworts** (Anthocerotae)
- 3b. Sporophytes with a spherical or ovate terminal capsule; thallus with several small chloroplasts in each cell **Liverworts** (Hepaticae)

MOSSES

KEY TO GENERA

- 1a. Leaf cells arranged in a network of narrow green cells enclosing large colorless cells, no midrib; large mosses of wet areas, branches clumped at tips of stems **Sphagnum**
- 1b. Leaf cells not arranged in a network 2.
- 2a. Upper leaf surface possessing erect, parallel green ridges (lamellae) extending lengthwise over midrib 3.
- 2b. Leaf surface lacking lamellae 5.
- 3a. Leaves shriveled or contorted when dry; leaf lamellae 2-6; calyptra smooth, capsules elongated, cylindric **Atrichum**
- 3b. Leaves rigid and not contorted wet or dry; leaf lamellae 16-60; calyptra hairy 4.
- 4a. Plants developing singly from a felty green mat (protonema) on soil; capsules cylindric **Pogonatum**
- 4b. Plants not developing from a green protonema; capsules 4 angled, inclined **Polytrichum**
- 5a. Stems erect, simple or sparingly branched; sporophytes, when present, produced at tips of erect stems (acrocarpous mosses) 6.
- 5b. Stems creeping (often with ascending branches), freely or pinnately branched, usually in interwoven mats; sporophytes lateral or at ends of branches (pleurocarpous mosses) 47.
- acrocarpous mosses**
- 6a. Leaves several layers thick, consisting mostly of midrib which is 1/2 to 2/3 the width of leaf base 7.
- 6b. Leaves a single layer in thickness; midrib narrower or lacking 8.
- 7a. Plants whitish-green; leaf tips straight; on soil or rotten wood **Leucobryum**
- 7b. Plants gray-green or yellow; leaf tips all bending sideways; on rock or tree base **Paraleucobryum**
- 8a. Plants blackish to dark reddish-brown; relatively short (about 13 mm) 9.
- 8b. Plants green to yellow, not particularly dark or brittle 11.
- 9a. On trees in small rounded cushions; capsules usually with 8 distinct longitudinal ridges **Orthotrichum**
- 9b. On granite rocks; capsules lacking ridges 10.
- 10a. Leaves with clear hair points; capsules opening by operculum **Grimmia**
- 10b. Leaves lacking clear hair points; capsules opening by 4 longitudinal slits **Andreaea**
- 11a. Leaves inserted on the stem in 2 rows, double bladed, split at base and clasping stem **Fissidens**
- 11b. Leaves in more than 2 rows (though sometimes strongly flattened) 12.
- 12a. Capsules tilted sideways, immersed in bristle-tipped leaves; small plant with a very short stem **Diphyscium**
- 12b. Capsules not as above 13.
- 13a. Plants very tiny, normally with capsules, ephemeral (lasting only a few weeks, usually between November and May); stemless or with very short stems 14.
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- 18a. Capsules barely emerging beyond leaves, each resembling a hot-air balloon **Bruchia**
 18b. Capsules extended on a long seta, ovoid in shape **Physcomitrium**
- 19a. Leaf cells papillose (with projections or bumps over cells) 20.
 19b. Leaf cells smooth 32.
- 20a. Basal leaf cells golden, square, somewhat enlarged or inflated; upper cells coarsely and irregularly papillose at back **Dicranum**
 20b. Basal leaf cells not golden, square and enlarged 21.
- 21a. Stems repeatedly branched; leaf tips colorless; capsules immersed in leaves along branches; green plants on rock **Hedwigia**
 21b. Stems simple or scarcely branched; sporophytes at tips of stems 22.
- 22a. Plants in small cushion-like tufts on trees and rocks 23.
 22b. Plants generally in more extensive clusters or tufts, nearly always on soil, rock, or tree roots (rarely, concrete) 27.
- 23a. Plants on rocks 24.
 23b. Plants on trees 25.
- 24a. Leaves contorted and crisped when dry **Ptychomitrium**
 24b. Leaves not contorted or only slightly so when dry **Ulota**
- 25a. Capsules exserted on long setae **Ptychomitrium**
 25b. Capsules immersed to shortly exserted 26.
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 26b. Capsules shortly exserted; leaves crisped and contorted when dry **Ulota**
- 27a. Leaves broad, strap-shaped, widest at middle or above; cells of lower 1/4 of leaf colorless (usually on concrete walls or abutments) **Tortula**
 27b. Leaves considerably longer than broad, lanceolate or linear, tapering to a slender tip from a broad base 28.
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- leaf cells smooth**
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75a. Leaves clasping stem and wide spreading to spreading at right angles to stem, the tips curved downward and V-channeled *Campyllum*

75b. Leaves erect or erect spreading, not V-channeled 76.

76a. Leaves acute or obtuse at tips; apical cells conspicuously shorter than the middle cells; operculum beak as long as urn of capsule *Eurhynchium*

76b. Leaves with slender tips; apical cells similar to middle cells; operculum merely sharp-pointed *Brachythecium*

midrib short & double or none

77a. Plants aquatic; stems long and trailing from point of attachment; in flowing water (rarely stranded) *Fontinalis*

77b. Plants terrestrial; a few occurring in wet areas but not inundated for long periods of time ... 78.

78a. Median leaf cells short, not more than 5 times longer than wide 79.

78b. Median leaf cells elongate, 6 to 20 times longer than wide 83.

median leaf cells short

79a. Leaves clasping stems and spreading at right angles to stems with tips V-channeled *Campyllum*

79b. Leaves not spreading or V-channeled 80.

80a. Leaf cells thick-walled, the cell cavity elliptic to linear; plants coarse, relatively robust; capsules emergent to exserted 81.

80b. Cell walls thin; plants small or minute; capsules exserted well beyond leaves 82.

81a. Secondary stems little branched; capsules exserted, calyptra smooth *Leucodon*

81b. Secondary stems freely and frequently branched, capsules exserted to immersed *Forsstroemia*

82a. Leaf margins coarsely toothed, blades 0.3 to 0.8 mm long *Fabronia*

82b. Leaves entire or nearly so, 0.2 to 0.5 mm long *Platydictya*

median leaf cells elongate

83a. Plants producing clusters of bud-like brood bodies at tips of branches *Platygyrium*

83b. Plants without brood branchlets, or brood branchlets produced in clumps along stems rather than at tips 84.

84a. Plants distinctly flattened 85.

84b. Plants not at all or only loosely and indistinctly flattened 89.

85a. Leaves secund; alar cells inflated in a group of 3-4 across insertion *Brotherella*

85b. Leaves not as above 86.

86a. Leaf bases extending down stems (decurrent) *Plagiothecium*

86b. Leaf bases attached abruptly to stem 87.

87a. Leaves broadly ovate, erect-spreading, entire; cells at leaf base loosely squared; capsules erect and symmetric *Entodon*

- 87b. Leaves lanceolate, widely spreading, usually finely toothed; cells at leaf base not differentiated; capsules mostly inclined and asymmetric 88.
- 88a. Leaves finely toothed, apical cells shorter than middle cells *Taxiphyllum*
- 88b. Leaves entire or finely toothed only near the apex; apical cells not differentiated *Isopterygium*
- 89a. Leaf tips strongly curved and turned to one side (falcate-secund) 90.
- 89b. Leaves not falcate-secund 92.
- 90a. Epidermal cells of stems and branches large and clear, stripping off with leaves on removal from stems; cells at leaf bases large, clear *Hypnum*
- 90b. Epidermal cells not large and clear; basal leaf cells various 91.
- 91a. Plants irregularly branched; on wet rocks in or near streams; leaves broad, hooded at apex; midrib variable, single or double, often well-developed *Hygrohypnum*
- 91b. Plants usually pinnately branched; in moist woodlands; leaves lanceolate or ovate with narrowed tips, not hood-shaped at apex; midrib short and double or none *Hypnum*
- 92a. Basal leaf cells inflated, often bubble-like 93.
- 92b. Basal leaf cells not inflated 94.
- 93a. Basal leaf cells inflated in narrow strips on the stem (decurrent) *Plagiothecium*
- 93b. Basal leaf cells inflated (and often yellow) in an abruptly conspicuous row of 3 to 4 cells at leaf attachment, leaf bases not decurrent *Sematophyllum*
- 94a. Plants on wet rocks in or near streams; leaves broadly pointed to rounded at apex, concave and often hooded *Hygrohypnum*
- 94b. Plants of drier habitats; leaves acute or narrowed to long tips, scarcely to distinctly concave basal angle cells tending to be differentiated (either lax or quadrate) 95.
- 95a. Plants on tree trunks; leaves curved in same direction when dry; branches short, crowded and conspicuously hooked at tips when dry *Pylaisiella*
- 95b. Plants on soil, base of trees (rarely limbs); leaves not turned in same direction; branch tips not hooked 96.
- 96a. Plants somewhat erect, pinnately branched; stems orange; branches cylindric, not flattened *Pleurozium*
- 96b. Plants creeping, irregularly branched; branches cylindric or slightly flattened, stems not orange *Entodon*

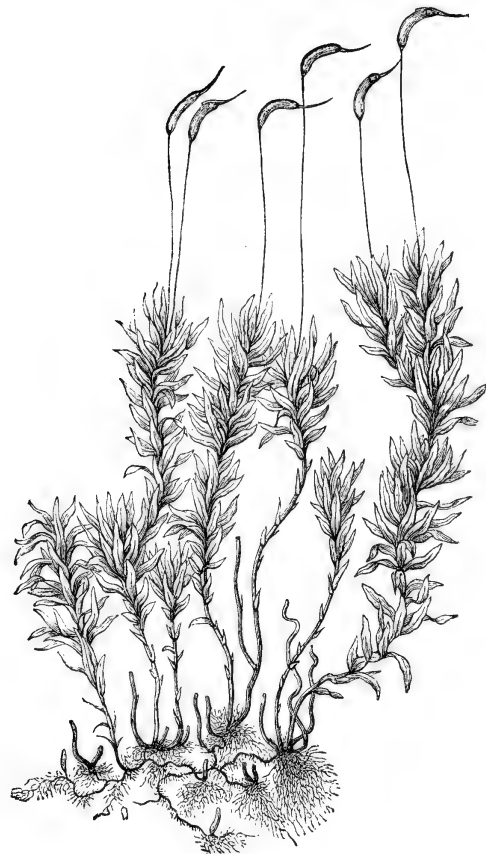
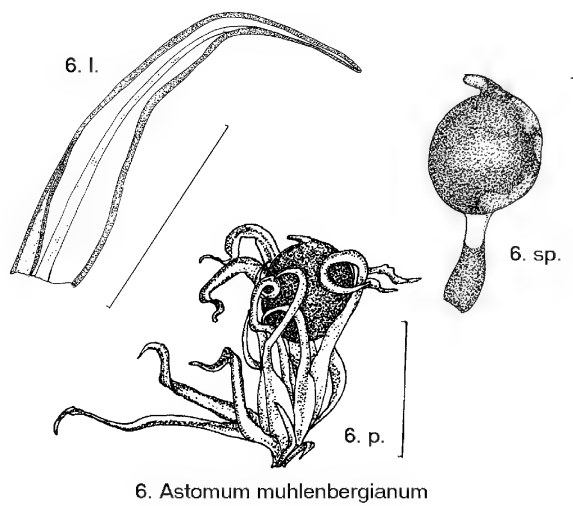
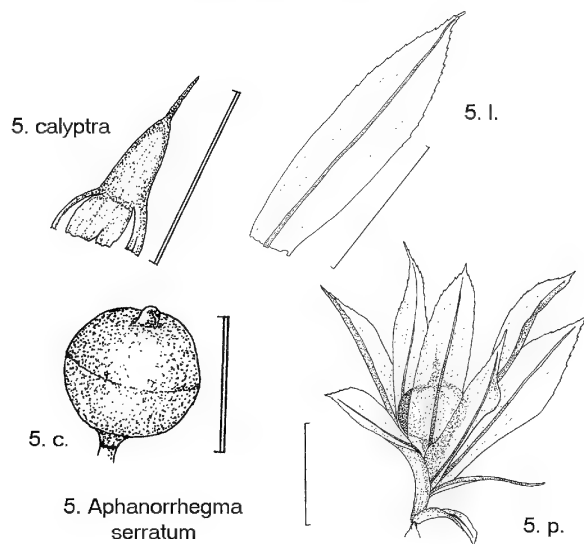
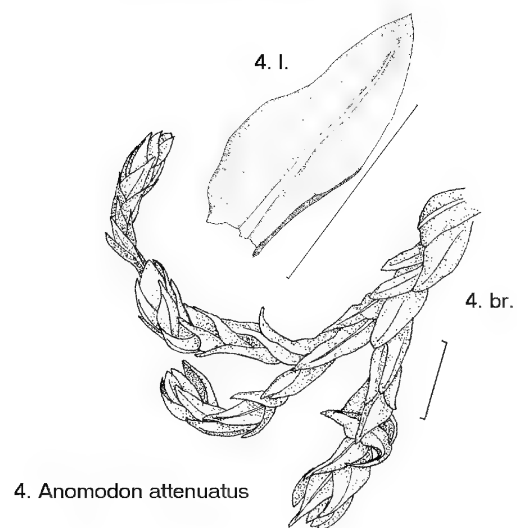
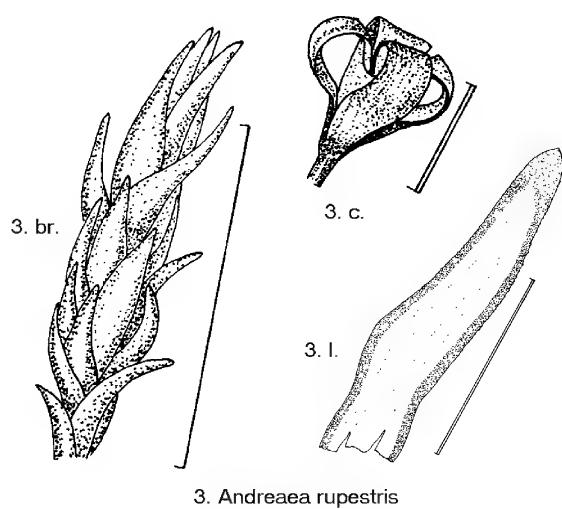
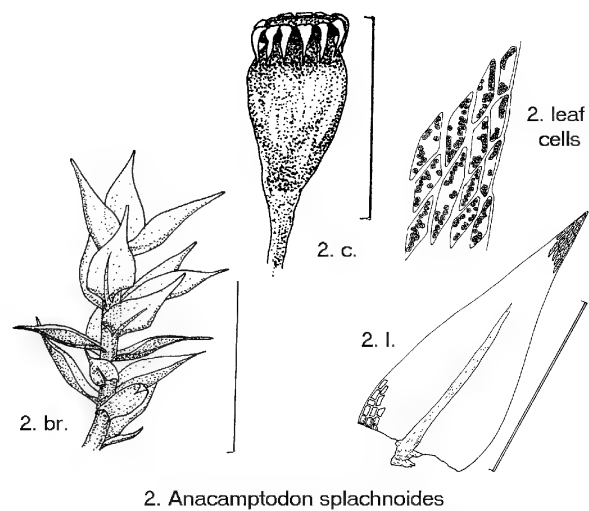
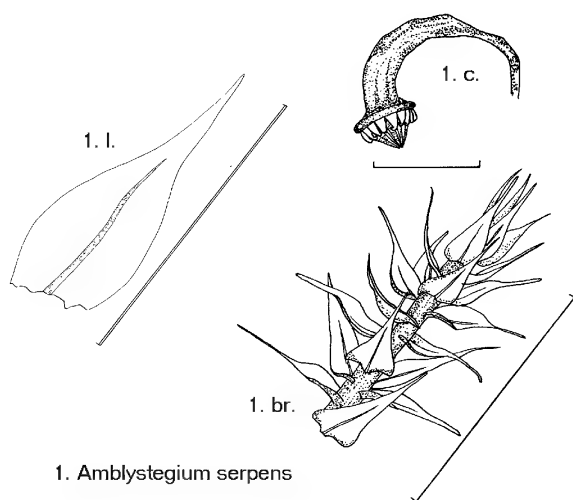


Fig. 1. *Atrichum undulatum*. [from A Handbook of Cryptogamic Botany by Alfred W. Bennett and George Murray, 1889. Longman's, Green, and Co. London. (as *Catharinea undulata*)]

PLATE 1



Moss Species and Ecology

1. *Amblystegium* BSG

Small creeping plants in loose mats, green to yellowish or brownish, irregularly to pinnately branched; in soft to somewhat rigid tufts, usually in wet places. Leaves small, ovate or lanceolate; midrib ending at or above leaf middle; cells smooth, rhombic to hexagonal above, longer and broader at base. Setae elongate, reddish; capsules strongly curved and inclined.

Only *Amblystegium* sensu stricto is treated here. Crum & Anderson (1981) also include the genera *Leptodictyum* and *Hygroamblystegium*. I follow Crum (1983: 270) when he states "It is convenient to separate the genera, though reasonable to combine them."

- 1a. Midrib ending in the leaf tip; upper leaf cells 2-3:1 *A. varium*
- 1b. Midrib 1/2 to 2/3 the leaf length; upper cells 3-5:1 *A. serpens*

1. *Amblystegium serpens* (Hedw.) BSG

Common on wet soil, humus, or rotten wood in swamps; often in drier conditions than the next species. Fluvanna, Prince Edward counties. Plate 1.

2. *Amblystegium varium* (Hedw.) Lindb.

On wet rocks in streams, soil or humus in wet shady places. Amelia, Appomattox, Prince Edward counties.

2. *Anacamptodon* Brid.

Small creeping plants with ascending branches in dense, dark-green or yellowish mats. Leaves erect and curving when dry, spreading when moist, ovate; cells rhombic above and rectangular below. Setae elongate, capsules erect and symmetric, cylindric, strongly contracted beneath mouth when dry.

Anacamptodon splachnoides (Brid.) Brid.

On bark of trees, particularly high up, in the protection of crotches, fissures, or knotholes. Prince Edward County. Plate 1.

3. *Andreaea* Hedw.

Small erect plants in dark, brittle tufts on granite rock, irregularly branched. Leaves mostly oblong ovate, concave; midribs lacking. Capsules shortly extended beyond leaves, spindle-shaped, splitting open to

release spores from base to apex, forming 4 valves.

Andreaea rupestris Hedw.

On granite rocks, especially rocky hemlock bluffs on N-facing slopes above rivers nearer to mountains. Campbell County (hemlock bluff). Plate 1.

4. *Anomodon* Hook & Tayl.

Fairly robust to large pleurocarpous plants in loose or dense, dull, rigid, dark green, yellowish, or brownish mats or cushions. Primary stems with small leaves, secondary stems ascending, branched; leaves dense, crowded, tongue-shaped, or lanceolate from a broad base; midrib strong, curving, ending below apex; cells small, hexagonal, densely multipapillose. Sporophytes, when produced, with wavy setae, the capsules symmetric, erect, ovoid or cylindric.

- 1a. Leaves ending in a short or long, clear hair-point; margins of leaf recurving ... *A. rostratus*
- 1b. Leaves not ending in a slender hair point; margins plane 2.
- 2a. Secondary stems highly branched, many branches narrowed and tapering to a slender tip; leaves with an abrupt point and finely toothed near apex. *A. attenuatus*
- 2b. Secondary stems sparingly branched; leaves usually ending in a single pointed cell or else entire 3.
- 3a. Leaf apex broad, rounded; on trees, stumps, logs *A. minor*
- 3b. Leaf apex usually with a single abrupt point; on rocks *A. viticulosus*

1. *Anomodon attenuatus* (Hedw.) Hub.

On bases of trees, rocks, or soil; frequently in swamps; very common. Appomattox, Campbell, Prince Edward counties. Plate 1.

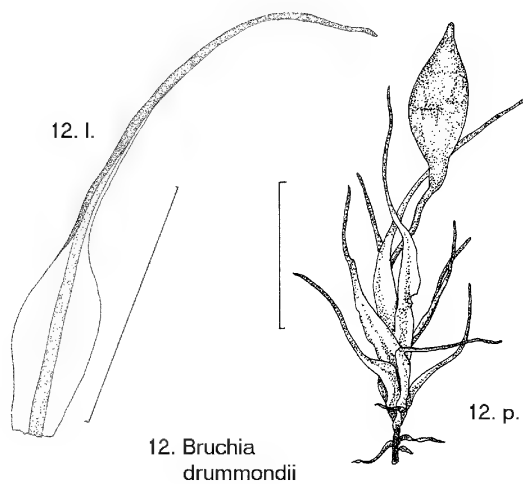
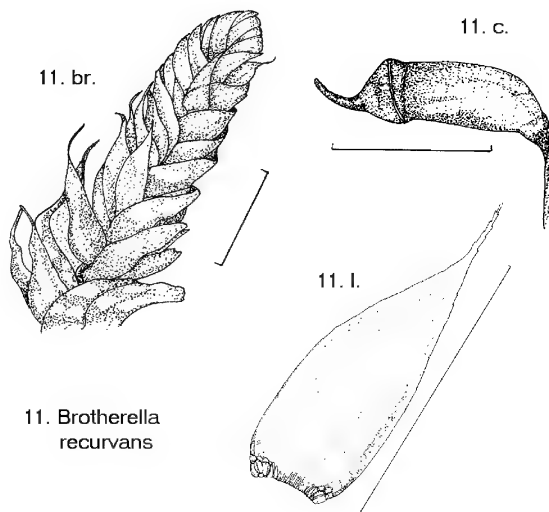
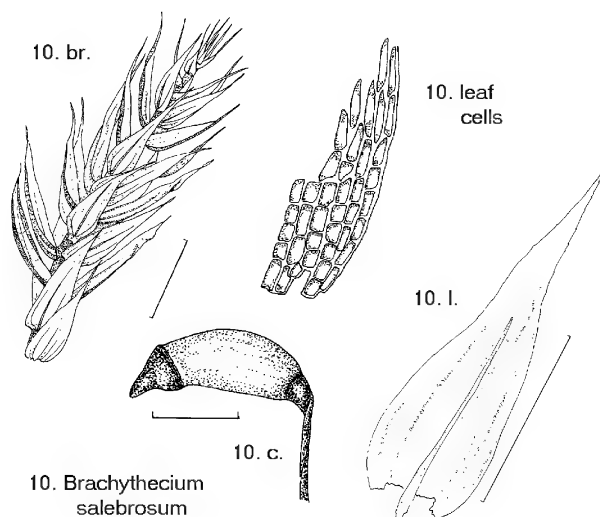
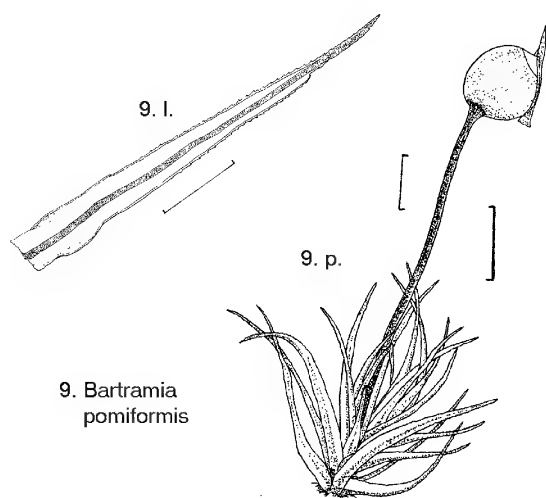
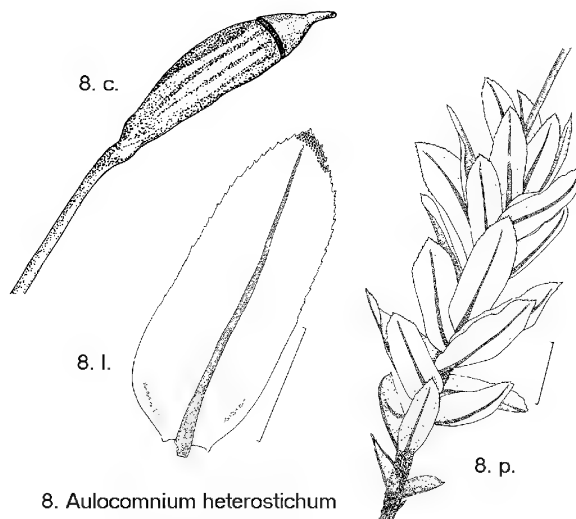
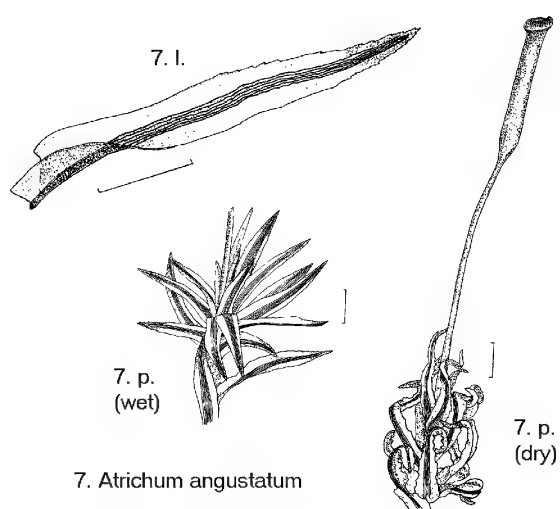
2. *Anomodon minor* (Hedw.) Furnr.

On trees in moist areas, sometimes on logs, rocks, or stumps. Prince Edward County.

3. *Anomodon rostratus* (Hedw.) Schimp.

On rock, soil, bases of trees, especially in mixed oak forests, beech-oak, or hemlock bluff forests. Appomattox, Buckingham, Fluvanna, Prince Edward counties.

PLATE 2



4. *Anomodon viticulosus* (Hedw.) Hook. & Tayl.
On rock along streams, occasionally on the base of trees. Spotsylvania County.

5. *Aphanorrhegma* Sull.

Very small, erect, scattered or gregarious plants, the stems often forked. Leaves spreading, oblong to obovate, tapering to a short point, unbordered, margins small-toothed above middle; midrib ending below apex; cells laxly oblong above, rectangular below. Capsules immersed in leaves, spherical, opening along the equator.

Aphanorrhegma serratum (W.J. Hook. & Wils. ex Drumm.) Sull. - On soil of stream banks, floodplains, car ruts, fields; December to February. Prince Edward County. Plate 1.

6. *Astomum* Hampe

Small erect plants, gregarious or loosely tufted on soil; leaves contorted when dry, spreading when moist, narrowly lanceolate from a broader base, tips acute, clear, margins often curled inward; midrib ending below apex or extending into it; cells small, hexagonal, densely papillose. Capsules immersed in leaves, spherical to elliptical.

Astomum muhlenbergianum (Sw.) Grout
On soil in lawns, pastures, floodplain sloughs, burned over areas; fruiting from late fall to early spring. Appomattox, Buckingham, Prince Edward counties. Plate 1.

7. *Atrichum* P. Beauv.

Erect plants, medium-sized to robust, in loose, dark-green tufts (becoming brown with age), rarely branched. Leaves strongly contorted when dry, spreading when moist, usually toothed at back of blade and midrib, tongue-shaped to lanceolate, concave toward apex, bordered by elongate cells and toothed on margins; midrib narrow, long, ending below apex, covered on upper side by few, long, somewhat wavy, green lamellae. Setae elongate, capsules cylindric slightly inclined to somewhat curved, smooth.

- 1a. Plants usually 1-2 cm tall; leaves somewhat concave toward apex; lamellae wavy, obscuring 1/4 to 1/2 of leaf in upper third
..... *A. angustatum*

- 1b. Plants typically more than 2 cm tall; leaves usually keeled toward the apex; lamellae straight, obscuring less than 1/4 of leaf in upper third *A. undulatum*

1. *Atrichum angustatum* (Brid.) BSG

On light, often sandy soil in dry open woods, often in lawns, roadbanks, or bare mounds in woods. Buckingham, Fluvanna, Lunenburg, Prince Edward counties. Plate 2.

2. *Atrichum undulatum* (Hedw.) P. Beauv.

On rich, humic soil in moist woods and shady ravines, also on clay or mud especially along streams. Mecklenberg, Prince Edward counties. Figure 1.

8. *Aulacomnium* Schwaegr.

Erect (to pendulous), robust plants in dull green or yellow-brown tufts. Leaves crowded, erect to spreading, lanceolate to ovate or elliptic, acute to obtuse or rounded, margins entire to toothed above; midrib tapered, wavy, ending below apex; cells rounded to oblong or elliptic, smooth or singly papillose on both surfaces. Setae, elongate, erect to inclined; capsules cylindric and somewhat curved, ribbed when dry.

- 1a. Leaves broad, apex rounded or acute, strongly toothed, cells smooth; sterile stems not producing gemmae-bearing stalks
..... *A. heterostichum*
- 1b. Leaves lanceolate, acute, finely toothed at apex; cells unipapillose; sterile stems stalked, producing cluster of minute, leaf-like gemmae at tips *A. palustre*

1. *Aulacomnium heterostichum* (Hedw.) BSG

On soil of ravine banks in mixed oak woods, often associated with *Bartramia pomiformis*. Amelia, Buckingham, Cumberland, Prince Edward counties. Plate 2.

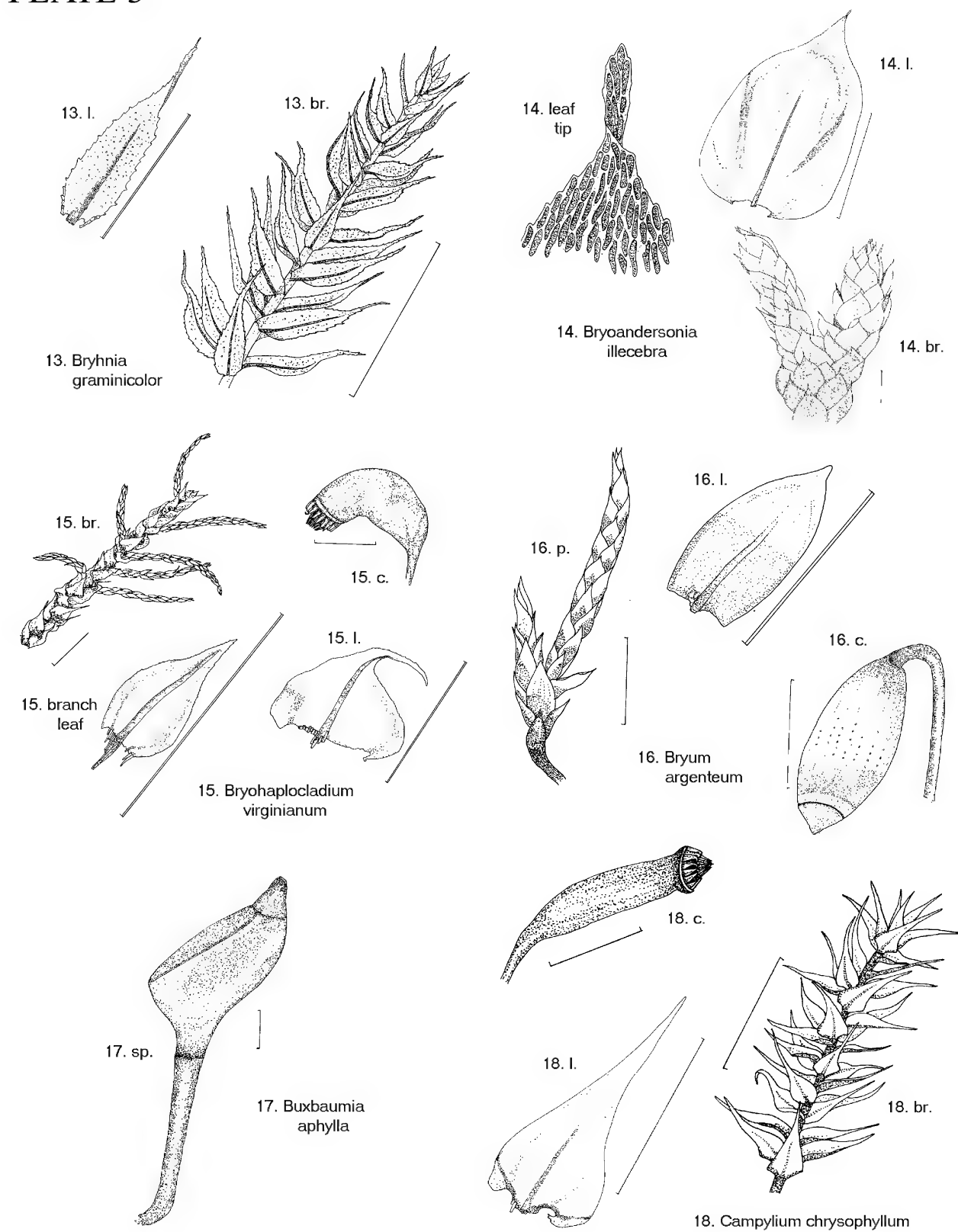
2. *Aulacomnium palustre* (Hedw.) Schwaegr.

On moist or wet soil in pastures, mixed oak woods, or along stream banks. Amelia, Buckingham, Cumberland, Prince Edward counties.

9. *Bartramia* Hedw.

Erect, small to rather robust moss, in loose to dense, often soft tufts, dull, green, yellowish above, yellow

PLATE 3



brown and covered with brown hairs below. Leaves sometimes crisped when dry, long, gradually or abruptly narrowed from a sheathing base to a linear lanceolate point; midrib prominent at back, ending below apex to extending beyond; upper cells small, quadrate to elongate, papillose at the ends; lower cells rectangular to linear, smooth. Setae elongate, capsules spherical, collapsed and deeply furrowed when dry.

***Bartramia pomiformis* Hedw.**

A common moss of ravine embankments on soil, in crevices of rocky bluffs or along wooded creeks; frequently with *Aulacomnium heterostichum*. Appomattox, Buckingham, Campbell, Charlotte, Fluvanna, Mecklenberg, Nottoway counties. Plate 2.

10. ***Brachythecium* BSG**

Plants creeping, slender to moderately robust, branches sometimes ascending, subpinnately to irregularly branched, often shiny. Leaves crowded, erect-spreading, somewhat concave, often pleated longitudinally, ovate to lanceolate, usually long-tapered to apex, the margins finely toothed to entire; midrib single, usually extending about 3/4 of leaf; cells smooth, elongate, often subquadrate at basal angles. Branch leaves smaller and narrower, with a shorter midrib. Setae elongate, capsules inclined to horizontal, ovoid to cylindric, rather short and broad, curved.

- 1a. Stems dendroid (tree-like); leaf alar cells enlarged and inflated, the bases decurrent (extending down the stem) ***B. rivulare***
- 1b. Stems spreading and irregularly to subpinnately branched; alar cells not inflated, leaves not or little decurrent on stems 2.
- 2a. Leaves plicate (folded or pleated longitudinally) 3.
- 2b. Leaves smooth or faintly plicate; plants medium to large; setae rough, at least in upper half 5.
- 3a. Cells of basal angles relatively large and laxly squared, transparent; capsules relatively short and broad ***B. salebrosum***
- 3b. Cells of basal angles of leaves rather small and dense; capsules oblong-cylindric 4.

- 4a. Plants small and shiny; branches somewhat cylindric when dry; branch leaves finely toothed in upper 1/2; cells across leaf base uniform in size; capsules symmetric ***B. acuminatum***
- 4b. Plants robust, dull to somewhat shiny; branches loosely cylindric; branch leaves finely toothed to base; cells across the base smaller and denser near the margin than near the midrib; capsules mostly asymmetric ***B. oxycladon***
- 5a. Branch leaves concave and pointing in the same direction, 1.3 to 2 mm long; setae rough above ***B. plumosum***
- 5b. Branch leaves not especially concave or all pointing in same direction (homomallous); 2 - 2.5 mm long; setae rough throughout ***B. rutabulum***

1. ***Brachythecium acuminatum* (Hedw.) Aust.**

On bark at base of trees and, less frequently, on rock or soil. Buckingham County.

2. ***Brachythecium oxycladon* (Brid.) Jaeg. & Sauerb.**

In disturbed places, commonly in lawns, on roadbanks and along woodland trails; on soil, rocks, and logs. Lunenburg County.

3. ***Brachythecium plumosum* (Hedw.) BSG**

On moist rocks, in or near streams. Expected but not yet collected.

4. ***Brachythecium rivulare* BSG**

On shaded soil and rocks, in seepy places around springs and in the overflow of streams in woods. Expected but not yet collected.

5. ***Brachythecium rutabulum* (Hedw.) BSG**

On soil, rocks, logs, and bark at base of trees in moist, shady places. Charlotte, Prince Edward counties.

6. ***Brachythecium salebrosum* (Web. & Mohr.) BSG**

On shaded soil, stones, bases of trees, and logs, usually in rather dry, disturbed places (such as lawns and bare mounds in hardwood forests). Plate 2.

11. ***Brotherella* Loeske ex Fl.**

Plants creeping, freely branched, in slender to moderately robust, green, yellowish or brownish green mats, very shiny. Setae elongate, capsules ovoid to cylindric, asymmetric, inclined, operculum short to long

beaked.

Brotherella recurvans (Michx.) Fleisch.

On soil, humus, bases of trees in moist woods. Campbell, Chesterfield counties. Plate 2.

12. ***Bruchia*** Schwaegr.

Small to very small mosses, erect, gregarious, yellowish or brownish; leaves elongate lanceolate, clasping. Capsules mostly immersed in leaves, pear-shaped. Ephemeral pygmy mosses.

- 1a. Spores densely spiculose (with many pointed projections), sometimes formed into a net-like pattern; neck of capsule tapered at base ***B. flexuosa***
- 1b. Spores with net-like ridges (reticulate), not spiculose; neck of capsule truncate (abruptly at right angles to seta) at base ***B. drummondii***

1. ***Bruchia drummondii*** Hampe ex Britt.

In old fields, burned over areas, disturbed sites, winter to spring. Buckingham County (on soil in burned pinelands). Plate 2.

2. ***Bruchia flexuosa*** (Sw. ex Schwaegr.) C. Muell. (includes *B. sullivantii*) - On soil in old fields, burned areas, floodplain soil; from late fall to late spring. Appomattox, Buckingham counties.

13. ***Bryhnia*** Kaur.

Plants creeping, slender to medium-sized, subpinnately branched, in loose or dense, green, yellowish or brownish, somewhat shiny mats; leaves ovate to lanceolate, acuminate. Setae elongate, red; capsules inclined to horizontal, cylindric, somewhat curved.

- 1a. Leaves + spreading, ovate or ovate-lanceolate, acute or broadly acuminate, twisted at apex (especially at branch tips), plane-margined; midrib smooth at back, upper cells 3-4: 1, minutely papillose at back .. ***B. novae-angliae***
- 1b. Leaves loosely erect, lanceolate, acuminate, flexing but not twisted at apex; margins narrowly recurved; midrib toothed at back and ending in a sharp spine; upper cells oblong-linear, strongly papillose at back ***B. graminicolor***

1. ***Bryhnia graminicolor*** (Brid.) Grout

On moist soil or rock on banks of roads or streams. Prince Edward County. Plate 3.

2. ***Bryhnia novae-angliae*** (Sull. & Lesq. ex Sull.)

Grout - On soil, humus, logs or rocks in wet, shady places, particularly in seepage near brooks. Mecklenburg, Prince Edward counties.

14. ***Bryoandersonia*** Robins.

Moderately robust, creeping mosses, with crowded ascending stems in dense, soft, green, yellow-green, or yellow-brown somewhat shiny tufts; leaves spoon-shaped, abruptly acuminate, apex twisted. Setae elongate, red-orange; capsules strongly inclined, curved and asymmetric, subcylindric, rarely seen.

Bryoandersonia illecebra (Hedw.) Robins.

On soil, over bases of trees, and over rock of ravines in mixed oak forests, beech-oak slopes, hemlock bluffs. Buckingham, Campbell, Charlotte, Fluvanna, Nottoway, Prince Edward, Spotsylvania counties. Plate 3.

15. ***Bryohaplocladium*** Wat. & Iwats.

Medium-sized creeping mosses in loose, dull, yellowish-brown or light green mats. Stems mostly pinnately branched, branches spreading to ascending; stem leaves ovate to lanceolate, acuminate; leaf cells quadrate to rhombic, singly papillose; paraphyllia few to abundant on stems. Setae elongate, becoming reddish; capsules inclined to horizontal and cylindric, constricted below mouth when dry. (Treated as *Haplocladium* by Crum & Anderson, 1981)

- 1a. Stem leaves gradually or abruptly with long tapering tips, pleated longitudinally, wavy and fine-toothed above ***B. microphyllum***
- 1b. Stem leaves abruptly short pointed, not pleated, flat, irregularly toothed above ***B. virginianum***

1. ***Bryohaplocladium microphyllum*** (Hedw.) Wat. & Iwats. - On old logs in swampy places, also on soil, rock, or bark at base of trees, occasionally on brick walls. Prince Edward County.

2. ***Bryohaplocladium virginianum*** (Brid.) Wat. & Iwats. - On soil, rotten wood, rocks, or bark at the

base of trees, usually in rather dry places and often in burned-over areas. Prince Edward County. Plate 3.

16. *Bryum* Hedw.

Small to robust erect plants, gregarious to densely tufted, stems usually forked, often with brownish hairs; leaves ovate to lanceolate; cells smooth, large, rhombic to rectangular to quadrate. Setae elongate; capsules mostly nodding or hanging down, subcylindric.

- 1a. Small silvery cylindrical plants; upper leaf cells transparent, conspicuously differentiated from lower cells..... *B. argenteum*
- 1b. Larger plants, not silvery or cylindrical; upper leaf cells not transparent or conspicuously different from lower cells..... 2.
- 2a. Midrib not or rarely extending beyond leaf tip 3.
- 2b. Midrib regularly and distinctly extending beyond leaf tip..... 4.
- 3a. Stems red; leaf bases extending down (decurrent) stems (especially when sterile); never producing axillary brood bodies in leaves *B. pseudotriquetrum*
- 3b. Stems green to brownish; leaf bases not decurrent; leaves often producing linear, brown, brood bodies in leaf axils *B. capillare*
- 4a. Upper leaf cells 3-4:1 *B. creberrimum*
- 4b. Upper leaf cells about 7:1 *B. caespiticium*

1. *Bryum argenteum* Hedw.

A small weedy plant on bare places in disturbed soil, in cracks of sidewalks, paths, old fields, along roads. Appomattox, Prince Edward counties. Plate 3.

2. *Bryum caespiticium* Hedw.

A weedy species growing on soil in open, disturbed places. Expected, but not yet collected.

3. *Bryum capillare* Hedw.

On rock, soil, or humus, especially on roadbanks, and also on bark at the base of trees or in crotches or drainage channels in tree trunks, less commonly on old logs or fence rails.

4. *Bryum creberrimum* Tayl. (*B. cuspidatum*)

A weed on sandy or rocky soil in disturbed places, especially on roadbanks or sides of ditches, sometimes

also on rock humus, or rotten wood. Appomattox County.

5. *Bryum pseudotriquetrum* (Hedw.) Gaertn., Meyer & Scherb. - On wet soil or humus, sometimes on rock or decayed wood, common in swamps and near streams and ponds. Amelia, Prince Edward counties.

17. *Buxbaumia* Hedw.

Small mosses, scattered, stems short, leaves few and inconspicuous, disappearing; recognized primarily from the large erect sporophyte. Sporophytes chestnut brown; setae erect, long; capsules strongly inclined, broadly ovoid, flattened on the upper side, with a small, erect operculum.

Buxbaumia aphylla Hedw.

On sandy soil embankments intermixed with lichens and other mosses in partial shade. Goochland County (February). Plate 3.

18. *Campyllum* (Sull.) Mitt.

Plants creeping, small and slender to moderately robust, in green to yellow or golden-brown, often shiny tufts or mats; leaves lanceolate to ovate, apex long acuminate, V-shaped; branching irregular to subpinnate. Setae elongate; capsules curved, subcylindric.

- 1a. Midrib single, ending at or somewhat above the leaf middle *C. chrysophyllum*
- 1b. Midrib none or very short and double *C. hispidulum*

1. *Campyllum chrysophyllum* (Brid.) J. Lange

On rocks, soil, rotten wood, and bases of trees in moist to wet woods. Nottoway, Prince Edward counties. Plate 3.

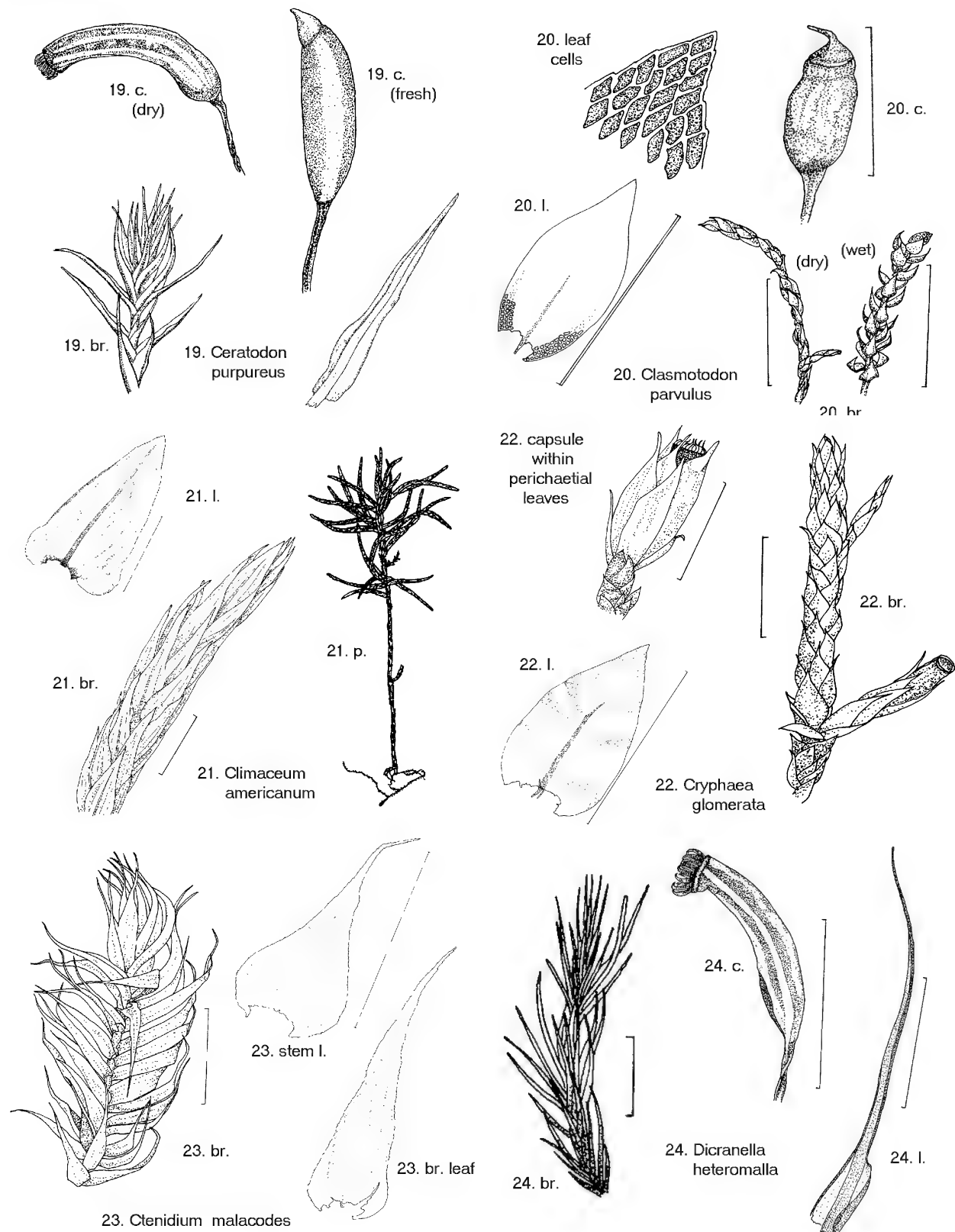
2. *Campyllum hispidulum* (Brid.) Mitt.

On soil, rocks, logs, and bases of trees in moist forests. Appomattox, Buckingham, Prince Edward counties.

19. *Ceratodon* Brid.

Small erect mosses in dense, dull tufts, often forked; leaves lanceolate, midrib strong; leaf cells quadrate to rectangular, thick-walled. Setae elongate; capsules long, dark, purplish-red, inclined to mostly horizontal, deeply furrowed when dry.

PLATE 4



Ceratodon purpureus (Hedw.) Brid.

A weedy species, exceedingly common on sterile soil and sometimes rock or old wood, usually in dry open disturbed places. Appomattox, Buckingham, Prince Edward counties. Plate 4.

20. ***Clasmatodon*** Hook. & Wils. ex Wils.

Small and slender creeping mosses in dull, green mats, freely and irregularly branched, branches usually short and erect; leaves small (less than 1 mm), ovate; cells quadrate to hexagonal. Capsules erect and symmetric, ovoid.

Clasmatodon parvulus (Hampe) Hook. & Wils. ex Sull. - On the bark of hardwood trees in swamps. Cumberland, Halifax, Prince Edward counties. Plate 4.

21. ***Climacium*** Web. & Mohr

A coarse and robust moss, resembling a conifer tree arising from an underground stem; leaves broadly lanceolate, with lobes at base; leaf cells rhombic to hexagonal, short 2-5:1, in loose or dense, dark green to yellowish tufts in swampy places. Sporophytes exceedingly rare.

Climacium americanum Brid.

On wet soil or humus in shady swampy habitats. Buckingham, Cumberland, Mecklenburg, Prince Edward counties. Plate 4.

22. ***Cryphaea*** Mohr ex Web.

Moderately-sized, pleurocarpous, dark green to yellowish, somewhat rigid plants in loose tufts; branching irregularly to pinnately, the branches often curved upward. Capsules immersed in leaves, erect, oblong to ovoid.

Cryphaea glomerata BSG ex Sull.

On trunks and branches of hardwood trees in swamps or along streams. Mecklenburg, Prince Edward counties. Plate 4.

23. ***Ctenidium*** (Schimp.) Mitt.

Medium-sized, creeping mosses, pinnately branched, in soft green to golden-brown, shiny mats. Setae

elongate; capsules strongly inclined to horizontal, oblong cylindric and somewhat curved.

Ctenidium malacodes Mitt. [*Ctenidium molluscum* (Hedw.) Mitt.] - On wet soil, decayed wood, rocky soil of steep, wooded slopes or ravines in pine-oak or hemlock formations. Buckingham, Mecklenburg, Prince Edward counties. Plate 4.

24. ***Dicranella*** (C. Muell.) Schimp.

Small erect mosses in loose, green, or yellowish tufts, occasionally forking. Setae erect, elongate, straight or flexuous; capsules erect or inclined, smooth or furrowed, symmetric or somewhat asymmetric, rounded to symmetric.

- 1a. Setae (stalks of capsules) yellow; midrib of leaf occupying 1/3 or more of width of leaf base; capsules suberect ***D. heteromalla***
- 1b. Setae reddish (especially with age); midrib of leaf occupying 1/5 to 1/4 of leaf base; capsules curved and inclined ***D. varia***

1. ***Dicranella heteromalla*** (Hedw.) Schimp.

On soil of shaded banks, especially along woodland trails or on soil of upturned tree roots; common. Buckingham, Fluvanna, Prince Edward counties. Plate 4.

2. ***Dicranella varia*** (Hedw.) Schimp.

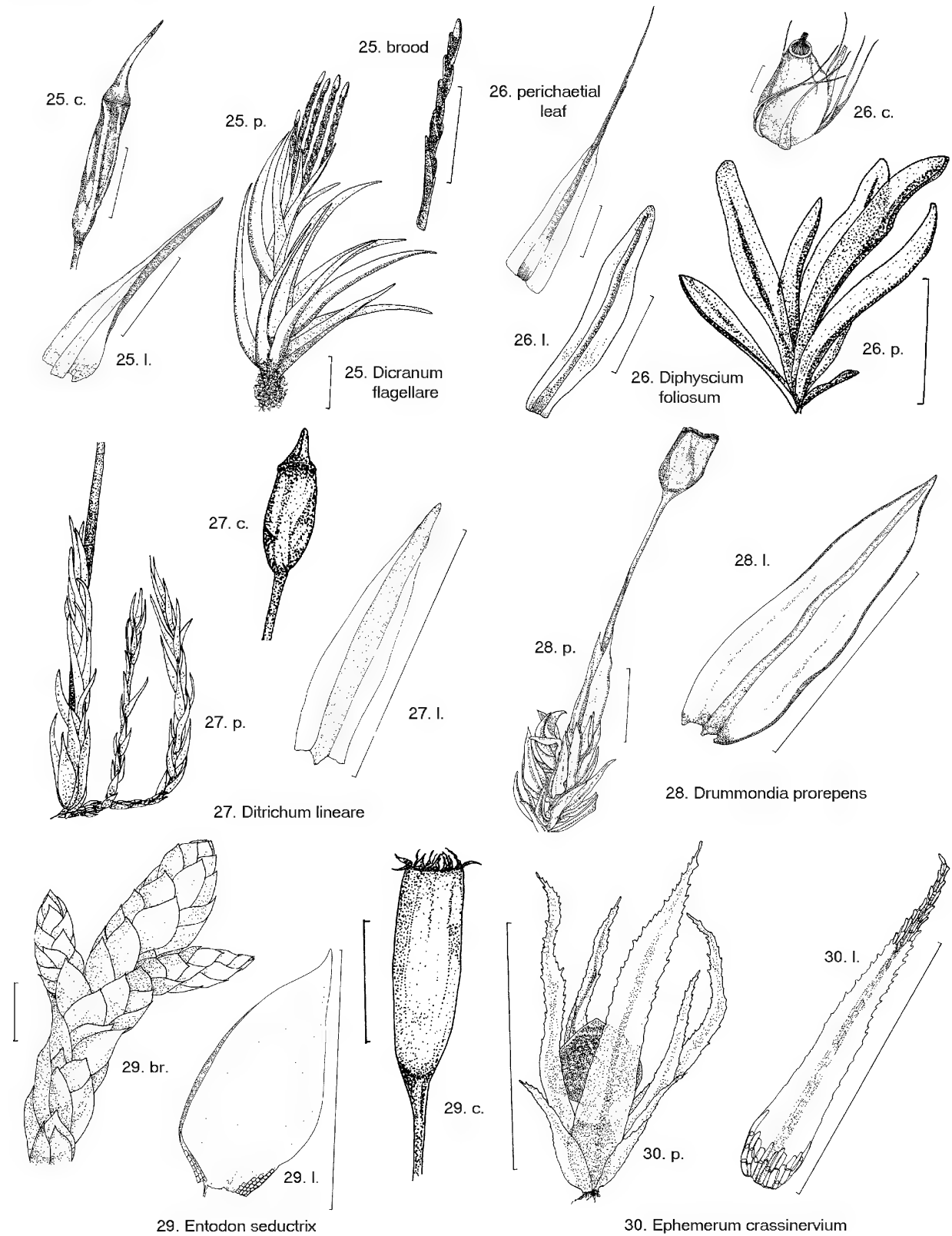
On wet or moist soil in open, disturbed places, on banks of roadside ditches. Prince Edward County.

25. ***Dicranum*** Hedw.

Erect, small to large mosses in dense tufts; stems simple or forked, hairy. Setae elongate, erect; capsules cylindric, somewhat asymmetric, nearly straight to curved and inclined or horizontal, furrowed when dry and empty.

- 1a. Plants bearing slender brood branches with reduced leaves in axils of upper leaves ***D. flagellare***
- 1b. Plants lacking slender brood branches in axils of upper leaves 2.

PLATE 5



- 2a. Upper cells elongate, the walls pitted; leaves erect or strongly curved, usually toothed at the margins *D. scoparium*
- 2b. Upper leaf cells short, not or indistinctly pitted 3.
- 3a. Leaves double-layered above; midrib about 1/3 the width of leaf base; on rock *D. fulvum*
- 3b. Leaves single-layered, concave or tubular above 4.
- 4a. Leaves somewhat wavy, broadly tapered from an ovate base, coarsely papillose at back *D. spurium*
- 4b. Leaves not wavy, but long and narrow, gradually tapering to the tip *D. flagellare*

1. *Dicranum flagellare* Hedw.

Common mosses of logs and stumps, occasionally on humus, tree bases, or rock. Prince Edward County. Plate 5.

2. *Dicranum fulvum* Hook.

On shaded acid rocks in deciduous woods, rarely on soil or bark at the base of trees. Amherst, Lunenburg counties.

3. *Dicranum scoparium* Hedw.

Our commonest *Dicranum*, in large bright green tufts on soil and humus, in open pine, mixed oak woods, and dense, moist forests; also on rock, the base of trees, and rotten wood. Buckingham, Campbell, Charlotte, Nottoway, Spotsylvania counties.

4. *Dicranum spurium* Hedw.

On dry acid sand or rock in exposed places such as rock ledges, scrubby oak or pine woods. Amelia, Amherst, Buckingham, Lunenburg, Spotsylvania counties.

26. *Diphyscium* (Hedw.) Mohr

Short, small mosses in stiff, dark green or brown to blackish, extensive tufts. Stems very short. Capsules immersed in midst of leaves, brownish-yellow becoming brown, asymmetric, oblique and mostly ovoid, swollen on one side.

Diphyscium foliosum (Hedw.) Mohr

Moist hardwood forests, especially mixed oak, on soil

or humus of shaded banks in late stages of moss-lichen succession. Amherst, Buckingham, Campbell, Fluvanna, Prince Edward, Spotsylvania counties. Plate 5.

27. *Ditrichum* Hampe

Small, erect, loosely tufted plants, simple or forked. Setae elongate; capsules cylindric or elliptic, suberect or inclined, often curved and asymmetric, furrowed when dry.

- 1a. Setae (stalks of capsule) bright yellow; capsules wrinkled when dry *D. pallidum*
- 1b. Setae red to brown; capsules rarely wrinkled 2.

- 2a. Plants producing branchlets with short, blunt leaves; leaf margins entire, plane *D. lineare*

- 2b. Plants unbranched or producing a normal branch with regular leaves; leaf margins minutely toothed, often recurved *D. pusillum*

1. *Ditrichum lineare* (Sw.) Lindb.

A pioneer on banks of sand or clay, especially in steep roadcuts; uncommon. Prince Edward County. Plate 5.

2. *Ditrichum pallidum* (Hedw.) Hampe

A common springtime moss in dry, open or partly shaded habitats on soil in fields, along roadsides (especially), and in mixed oak woods. Appomattox, Buckingham, Nottoway, Prince Edward counties.

3. *Ditrichum pusillum* (Hedw.) Hampe

On bare, disturbed soil of roadbanks, sometimes in crevices between rocks. Prince Edward County.

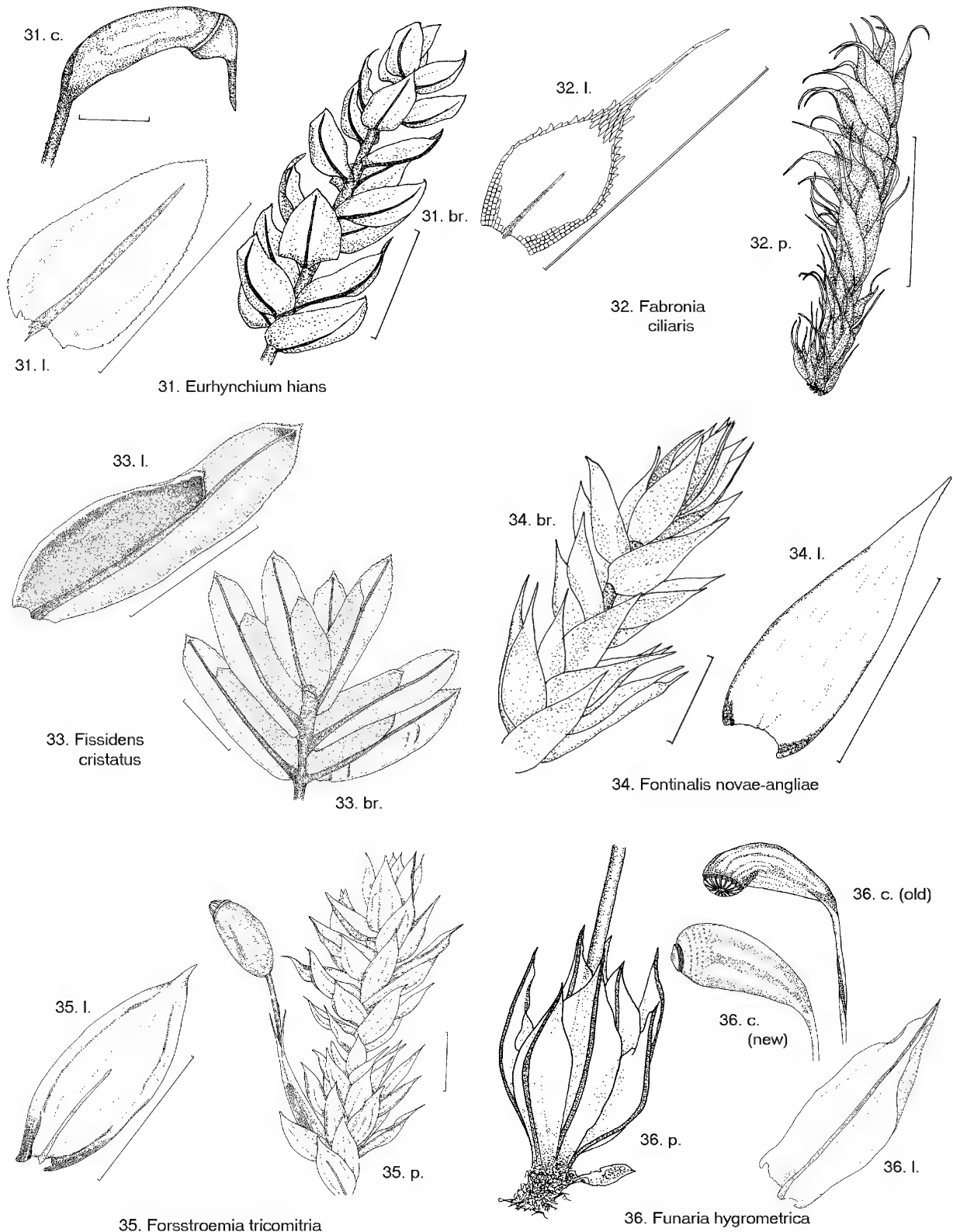
28. *Drummondia* Hook ex Drumm.

Plants of medium size, in low dense, rigid, dull, dark-green or blackish mats. Stems long and creeping, densely branched; branches short, simple or forked, ascending. Setae produced at ends of branches, elongate; capsules erect, ovoid, becoming somewhat wrinkled when dry.

Drummondia prorepens (Hedw.) E. G. Britt.

On the trunks and branches of hardwoods, especially oaks, hickories, occasionally red cedar. Lunenburg, Prince Edward counties. Plate 5.

PLATE 6



29. *Entodon* C. Muell.

Plants creeping, irregularly to somewhat pinnately branched, green, yellow or golden-brown, in more-or-less shiny mats or tufts. Setae short to elongate, reddish; capsules erect and symmetric, cylindric, brown.

- 1a. Stems and branches rounded, leaves not flattened *E. seductrix*
- 1b. Stems and branches distinctly flattened; leaves flattened 2.
- 2a. Teeth and segments of the peristome densely papillose; leaves entire or nearly so *E. compressus*
- 2b. Teeth finely papillose, segments smooth; leaves toothed at the apex *E. cladorrhizans*

1. *Entodon cladorrhizans* (Hedw.) C. Muell.

On rotten wood and bark at the base of trees, also on tops of horizontal branches, also on soil humus, and rocks in dry deciduous forests but also on drier surfaces in swamps. Charlotte, Prince Edward counties.

2. *Entodon compressus* C. Muell.

On bark at the base of trees, also on logs or stumps and soil or rock; uncommon. Buckingham, Prince Edward counties.

3. *Entodon seductrix* (Hedw.) C. Muell.

On rotten wood, bark at the base of trees, rocks, and soil among hardwoods, in rather dry open woodlands, occasionally in pastures and lawns. Fluvanna, Prince Edward counties. Plate 5.

30. *Ephemerum* Hampe

Tiny, delicate mosses growing from a shiny protonema, scattered to clustered; leaves lanceolate, few; capsules sessile, ovoid to spherical, without opercula.

- 1a. Leaves lacking a midrib, margins strongly toothed *E. serratum*
- 1b. Leaves with a midrib (although sometimes weak) 2.
- 2a. Leaves linear-lanceolate, the margins spinose toothed, the teeth recurving *E. spinulosum*

- 2b. Leaves lanceolate to ovate lanceolate, toothed but lacking strongly recurving teeth; cells papillose *E. crassinervium*

1. *Ephemerum crassinervium* (Schwaegr.) Hampe

On moist soil in disturbed places, particularly in old fields, also on riverbanks in late summer to early spring. Prince Edward County. Plate 5.

2. *Ephemerum serratum* (Hedw.) Hampe

On moist soil in old fields, in floodplains, along riverbanks; fall to spring. Prince Edward County.

- 3. *Ephemerum spinulosum* Bruch & Schimp. ex Schimp. - On moist soil in disturbed places, including river banks, old fields; fall through spring. Buckingham, Prince Edward counties.

31. *Eurhynchium* BSG

Plants small, dark to shiny green or brownish, in loose to dense mats of tufts. Stems creeping or ascending, irregularly to pinnately branched, sometimes tree-like. Setae elongate, rough or smooth; capsules inclined to horizontal, subcylindric and somewhat asymmetric; the operculum with a long beak.

- 1a. Branch leaves broadly ovate, acute; setae rough *E. hians*
- 1b. Branch leaves narrowly oblong-ovate, bluntly acute to rounded obtuse; setae smooth *E. pulchellum*

1. *Eurhynchium hians* (Hedw.) Sande-Lac.

On soil, occasionally other substrates, in damp, shady places. Buckingham, Campbell, Mecklenburg, Prince Edward, Spotsylvania counties. Plate 6.

2. *Eurhynchium pulchellum* (Hedw.) Jenn.

On soil or humus, particularly on low mounds in woods, or on rotten logs or stumps, bark at base of trees or rocks. Buckingham, Prince Edward counties.

32. *Fabronia* Raddi

Plants small, silky, creeping, deep to moderately green in mats, irregularly and closely branched, the branches short, ascending. Leaves crowded, ovate and gradually drawn out into a long slender tip, the tip formed of a long, almost clear cell; margins conspicuously and

irregularly toothed; midrib extending to midleaf; median cells rhombic, short, basal cells quadrate. Setae short; capsules erect, pear-shaped to ovoid.

Fabronia ciliaris (Brid.) Brid.

On trunks of hardwood trees, often along streets in towns (less commonly on rocks of various kinds). Farmville, Prince Edward County (courthouse, on elm). Plate 6.

33. ***Fissidens*** Hedw.

Erect, large to small, clustered, simple or sparsely branched mosses, attached at base. Leaves sticking out from stem in two distinct rows, split on lower side from the midrib, forming 2 plates (laminae) which clasp the stem at base. Setae terminal or lateral, elongate; capsules erect to inclined, symmetric to curved, operculum usually beaked; sporophytes not common.

- 1a. Plants aquatic, submerged, or attached to trees below the high water line in swamps ***F. fontanus***
- 1b. Plants on soil, logs, trees or rocks 2.
- 2a. Leaves bordered, at least in part with long narrow cells ***F. bryoides***
- 2b. Leaves not bordered by linear cells 3.
- 3a. Midrib covered by short, green cells toward leaf tip, thus appearing obscure ***F. subbasilaris***
- 3b. Midrib not covered by short green cells 4.
- 4a. Leaves coarsely and unevenly toothed toward tip, bordered by 3-5 rows of pale cells 5.
- 4b. Leaves entire or evenly and finely toothed; not or indistinctly paler at margins 6.
- 5a. Leaf cells rounded, bulging, dark green and obscure; pale margin distinct ***F. cristatus***
- 5b. Leaf cells hexagonal, flat or somewhat convex; pale margin somewhat indistinct ***F. adiantoides***
- 6a. Midrib ending 4-11 cells below toothed leaf tips ***F. osmundoides***
- 6b. Midrib ending in or very near pointed leaf tip 7.

- 7a. Midrib brown, ending in a stout point ***F. taxifolius***
- 7b. Midrib colorless, ending in or near a minute point ***F. bushii***

1. ***Fissidens adianthoides*** Hedw.

On damp soil or humus, rocks, logs, stumps, or bark of exposed roots or tree bases, in woods.

2. ***Fissidens bryoides*** Hedw.

On wet rocks or soil, often in or along brooks. Amelia, Prince Edward counties.

3. ***Fissidens bushii*** (Card. & Ther.) Card. & Ther.

On soil and occasionally on rocks, in open woods or in exposed, disturbed places. Buckingham, Prince Edward counties.

4. ***Fissidens cristatus*** Wils. ex Mitt.

On soil or humus, bark of exposed roots at bases of trees, rotten wood, and rocks in woods. Buckingham, Prince Edward counties. Plate 6.

5. ***Fissidens fontanus*** (B. Pyl.) Steud.

Submerged in flowing water or in swamps, often attached to trees below the high water line. Prince Edward County.

6. ***Fissidens osmundoides*** Hedw.

On soil, humus, rocks, or logs, in woods. Nottoway, Prince Edward counties.

7. ***Fissidens subbasilaris*** Hedw.

On bark at the base of trees or rock. Fluvanna County.

8. ***Fissidens taxifolius*** Hedw.

On damp, clayey soil and rock. Buckingham County.

34. ***Fontinalis*** Hedw.

Plants aquatic, submerged and trailing, freely and irregularly branched above a naked base, slender to robust, usually dark and dull colored. Not often with capsules, but capsules on short setae, immersed to emergent, operculum conic.

- 1a. Plants exceedingly slender and thread-like, up to 10 to 15 cm long; leaves slenderly lanceolate ***F. filiformis***
- 1b. Plants of moderate to large size 2.

- 2a. Stem and branch leaves intergrading in size and shape 3.
- 2b. Stem and branch leaves differing in size, sometimes also in shape; plants slender, stems rigid; leaves firm and narrowly lanceolate, well spaced *F. sullivanii*
- 3a. Branches ending in a conspicuous, slender, elongate cylindric tip; leaves rather crowded, mostly erect, acute, with margins reflexed when dry *F. dalecarlica*
- 3b. Branches ending in a shorter, less conspicuous cylindric tip; leaves less crowded and mostly spreading (except at branch tips), acute to blunt or obtuse, with margins plane when dry
..... *F. novae-angliae*

1. *Fontinalis dalecarlica* BSG

Attached to rocks and submerged in swiftly running water. Cumberland, Prince Edward counties.

2. *Fontinalis filiformis* Sull. & Lesq. ex Aust.

Attached to logs, stumps, roots, and bases of bushes submerged in streams and stagnant water. Chesterfield County.

3. *Fontinalis novae-angliae* Sull.

Attached to various substrates, submerged in shallow, flowing water. Amherst, Buckingham, Powhatan, Prince Edward counties. Plate 6.

4. *Fontinalis sullivanii* Lindb.

On rocks, bases of trees and shrubs, or roots, in pools or streams, often in stagnant water. Prince Edward County.

35. *Forsstroemia* Lindb.

Moderately robust creeping plants in loose, yellowish green to brownish tufts; secondary stems erect, sparsely to freely branched. Capsules immersed to shortly exserted, ovoid. Resembling a *Leucodon* in many respects but according to Crum & Anderson (1981: 757) "... softer and paler, with secondary stems straight, spreading from the substrate, and subpinnately branched."

Forsstroemia trichomitria (Hedw.) Lindb.

On the bark of trees, on trunks, branches and twigs, mostly in swamps. Buckingham County. Plate 6.

36. *Funaria* Hedw.

Small to medium-sized, erect mosses, in clusters or in bright green or yellowish, loose tufts. Stems usually unbranched. Setae elongate, capsules inclined to drooping, asymmetric, usually curved, broadly pear-shaped, usually furrowed when dry and empty. Although not ephemeral mosses, they are seldom collected or recognized without sporophytes which are produced in springtime.

- 1a. Leaves slender, tapering to a pointed tip, upper cells not differentiated at margins; sporophyte setae not flexed and twisting from humidity; capsule mouth slightly asymmetric
..... *F. flavicans*
- 1b. Leaves acute or shortly tapering to tip; upper cells slightly narrower at margins; setae flexed and twisting from humidity; capsule mouth very asymmetric, almost paralleling one side of capsule *F. hygrometrica*

1. *Funaria flavicans* Michx.

On soil or among rocks in disturbed places, such as burned-over woods, gardens, and roadsides. Prince Edward County.

2. *Funaria hygrometrica* Hedw.

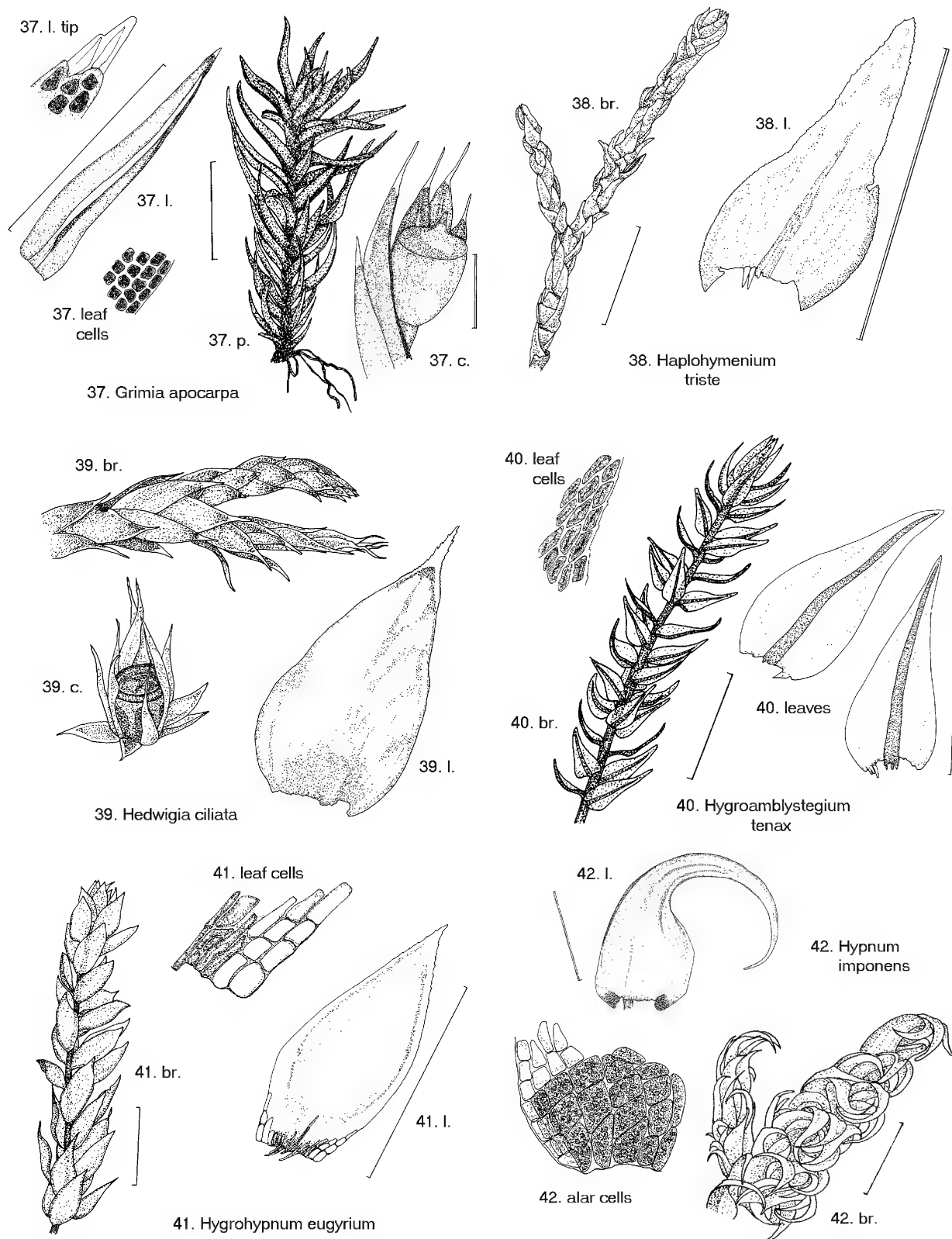
A weed of disturbed habitats, usually on soil but sometimes wood or rock; common in poor lawns, old campfire sites or burned areas; a springtime plant. Appomattox, Buckingham, Prince Edward counties. Plate 6.

37. *Grimmia* Hedw.

Plants erect, small to medium-sized, in dull, rigid, dark green, brown or blackish tufts or mats, mostly on dry, exposed rocks. Stems erect, forked. Leaves frequently with clear, whitish hair points. Capsules immersed in leaves to exserted, globose to ovoid; calyptra not hairy.

- 1a. Upper leaves without white or clear hair-points except for an occasional clear terminal cell; capsules emergent or slightly exserted
..... *G. alpicola*
- 1b. Upper leaves ending in clear or whitish hair-points 2.

PLATE 7



- 2a. Leaves not keeled (V-shaped in cross-section), lying flat on a slide; midrib flat, not prominent at back; leaf tip usually acute; capsules exserted ***G. laevigata***
- 2b. Leaves keeled, some lying folded at least at apex; capsules immersed ***G. apocarpa***

1. ***Grimmia alpicola*** Hedw.

On dry granite rock. Prince Edward County.

2. ***Grimmia apocarpa*** Hedw.

On rocks in dry exposed places. Lunenburg, Nottoway counties. Plate 7.

3. ***Grimmia laevigata*** (Brid.) Brid.

On exposed rock or soil over rock. This species is important in primary succession on vast expanses of flat granitic rocks along the Fall Line and throughout the Piedmont. Albemarle, Amelia, Lunenburg, Nottoway, Prince Edward, Spotsylvania counties.

38. ***Haplohymenium*** Dozy & Molke

Small creeping plants, freely and irregularly branched, in dull, dark green or yellow-green to brown rigid mats.

Haplohymenium triste (Ces. ex De Not.) Kindb.

On trunks, sometimes branches of trees, rarely on logs or rocks in loose patches. Amherst, Buckingham, Prince Edward counties. Plate 7.

39. ***Hedwigia*** P. Beauv.

Robust, irregularly branched, erect mosses in dull green, yellow, or grayish mats, usually with clear-tipped leaves. Capsules almost spherical, deeply immersed in sheathing leaves.

Hedwigia ciliata (Hedw.) P. Beauv.

On dry granitic boulders in fields or dry and open woods. Appomattox, Fluvanna, Halifax, Lunenburg, Nottoway, Prince Edward counties. Plate 7.

40. ***Hygroamblystegium*** Loeske

Small, dark or yellow-green creeping mosses, freely and irregularly branched, forming mats in wet, often submerged, habitats. Leaves with strong midribs. Setae long, capsules curved-cylindric.

Hygroamblystegium tenax (Hedw.) Jenn.

(*Amblystegium tenax* of some authors) - On wet rocks in and beside brooks. Amelia, Buckingham, Campbell, Mecklenburg, Prince Edward, Spotsylvania counties. Plate 7.

41. ***Hygrohypnum*** Lindb.

Creeping, irregularly branched, moderate-sized mosses, in shiny, yellowish to golden-brown soft mats. Leaves concave, crowded, with midrib short, single or forked, strong. Setae long, reddish, capsules cylindric, almost erect, curved when dry.

Hygrohypnum eugyrium (BSG) Loeske

On wet rocks in or along streams. Buckingham, Spotsylvania counties. Plate 7.

42. ***Hypnum*** Hedw.

Creeping slender to robust mosses, irregularly to pinnately branched, in green, yellowish, or golden green mats or tufts. Stems and branches usually hooked at tips. Leaves crowded, strongly curved and turned to one side. Setae long; capsules erect to inclined, cylindric, curved and asymmetric.

1a. Cells at basal angles of leaves squarish, not thin-walled or inflated; capsules suberect 2.

1b. Basal angle cells clear, + enlarged or inflated, thin-walled; capsules inclined 3.

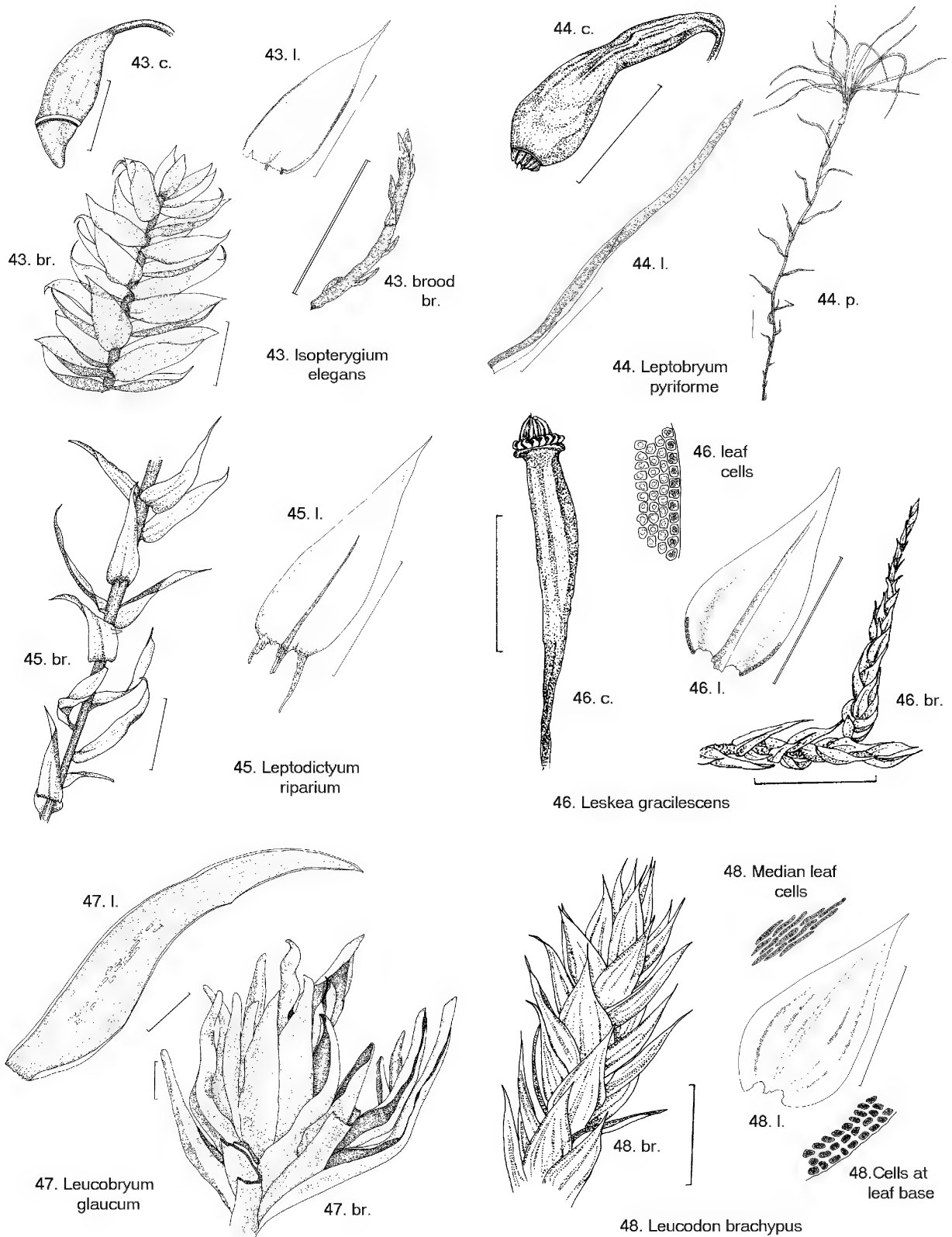
2a. Rather robust plants with 4-6 opaque, squarish cells occurring along leaf margins, below them a few somewhat larger, clear or orange-brown cells ***H. imponens***

2b. Rather small plants with numerous opaque quadrate cells occurring in triangular groups; leaf margins with small teeth nearly all around ***H. pallescens***

3a. Stems prostrate, closely and regularly pinnate; outer stem cells not or somewhat enlarged; leaves toothed to well below apex, usually in the upper 1/3 to 1/2 4.

3b. Stems usually ascending, loosely and irregularly branched; outer stems cells conspicuously enlarged; leaves entire or toothed only near apex; basal cells abruptly inflated ***H. lindbergii***

PLATE 8



- 4a. Outer stem cells not enlarged; pseudoparaphyllia (leaf-like structures) none; leaves broad, triangular-ovate, broadly tapering to apex, abruptly rounded at base to leaf insertion *H. curvifolium*
- 4b. Outer stem cells somewhat enlarged; pseudoparaphyllia present at base of branches or where new branches are forming; leaves narrow, lanceolate, somewhat rounded to insertion *H. fertile*

1. *Hypnum curvifolium* Hedw.

In moist shady soil in pine-oak forests, on banks, sometimes on humus, logs, or bark at the base of trees. The commonest upland *Hypnum* in our area. Appomattox, Buckingham, Fluvanna, Halifax, Mecklenburg, Prince Edward, Spotsylvania counties.

2. *Hypnum fertile* Sendtn.

On rotten logs in woods. Appomattox, Buckingham, Campbell, Prince Edward, Spotsylvania counties.

3. *Hypnum imponens* Hedw.

On rotten logs and commonly also on rock, soil, humus, or rarely bark at the base of trees in moist or wet forests. Campbell, Fluvanna, Nottoway, Prince Edward counties. Plate 7.

4. *Hypnum lindbergii* Mitt.

On wet soil, humus, or rotten logs in swamp forests or sedge meadows, especially along low margins of lakes or ponds. Amelia, Buckingham, Campbell, Fluvanna, Mecklenburg, Prince Edward counties.

5. *Hypnum pallescens* (Hedw.) P. Beauv.

(*H. reptile* Michx.) - On bark at the base of trees, less commonly on logs, rocks, and other substrata, in woods.

43. *Isopterygium* Mitt.

Small creeping mosses in shiny, pale or bright green to yellowish mats. Stems irregularly to pinnately branched; branches spreading. Leaves flattened, lanceolate to ovate; midrib short and double or lacking. Setae long, capsules inclined to horizontal, ovoid to cylindric, symmetric to curved.

- 1a. Brood branchlets distributed along length of stems and branches, clustered in leaf axils; basal cells (alar) of leaf not or slightly differentiated *I. elegans*

- 1b. Brood branchlets lacking; cells of basal angles of leaf somewhat different, short oblong to square *I. tenerum*

1. *Isopterygium elegans* (Brid.) Lindb.

On granitic type rocks on hemlock bluffs, also on soil or humus of banks in moist woods. Campbell, Charlotte counties. Plate 8.

2. *Isopterygium tenerum* (Sw.) Mitt.

On logs and stumps, bark at the base of trees, and sandy soil, typically in rather dry places such as pine woods but sometimes in swampy habitats. Prince Edward County.

44. *Leptobryum* (BSG) Wils.

Slender, erect, unbranched mosses in loose or dense shiny, light or yellow-green tufts. Leaves small and remote below, abruptly larger and crowded at stem tips. Setae terminal, long; capsules strongly inclined to pendulous, pear-shaped from a slender neck.

Leptobryum pyriforme (Hedw.) Wils.

A common weed on soil, rotten wood, humus, or occasionally rock in wet places, particularly in swamps, burned-over habitats, common in greenhouses, eve-drip zone on soil around houses. Plate 8.

45. *Leptodictyum* (Schimp.) Warnst.

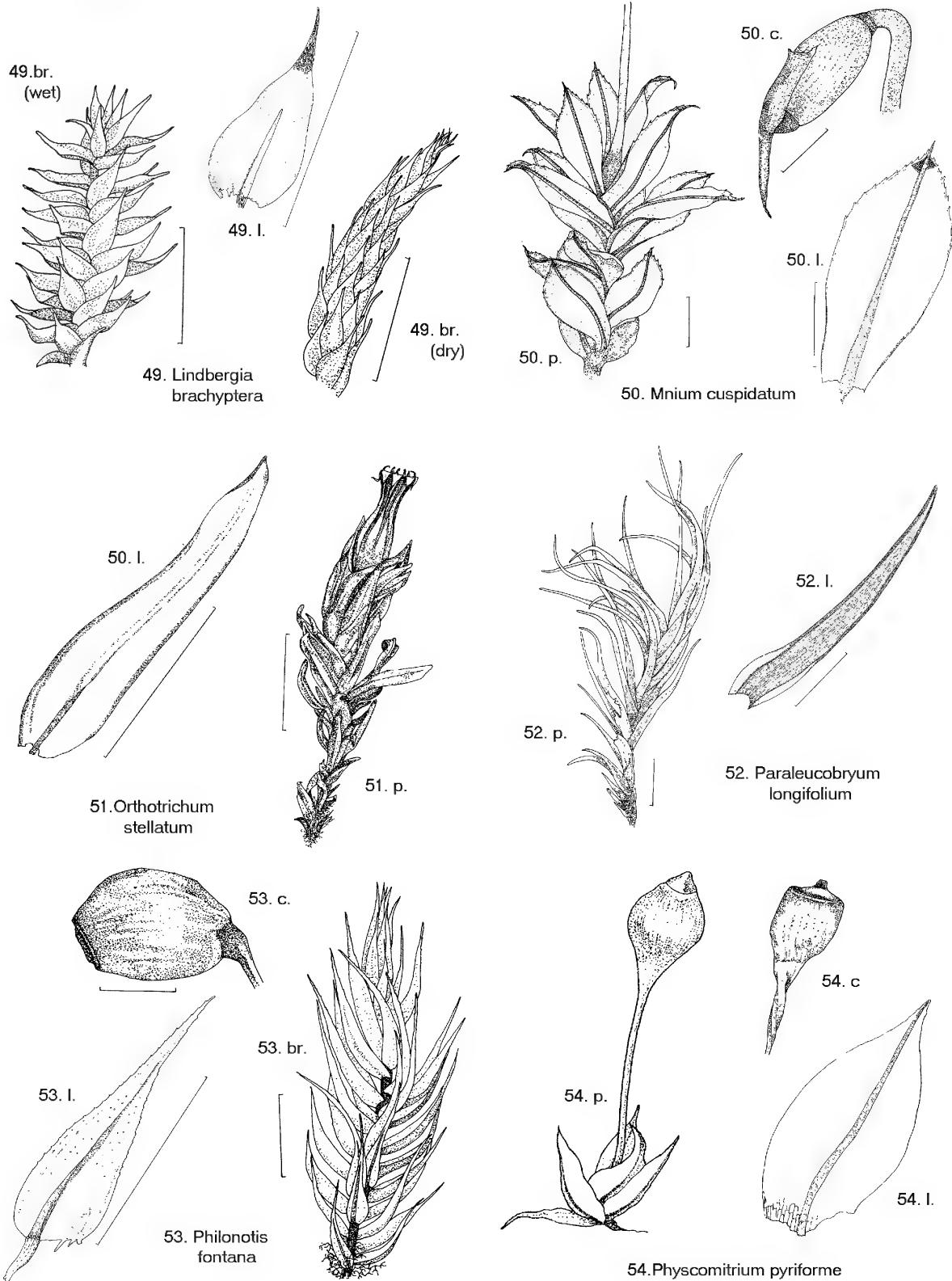
Creeping, mosses, medium-sized to robust; in thin, dull, dirty green or yellowish mats, usually in wet places, sometimes submerged. Stems freely and irregularly to subpinnately branched. Leaves soft, flat, distant, wide spreading; midrib single above mid-leaf; cells smooth. Setae long; capsules curved, not common.

- 1a. Leaves wide-spreading, forming an angle of 80 -90 degrees with stem, 1-1.6 mm long; median leaf cells 3-6 times as long as wide *L. humile*
- 1b. Leaves erect-spreading, forming an angle of 30-60 degrees with stem; 1.2 - 5.0 mm long; median leaf cells 5-15 times as long as wide *L. riparium*

1. *Leptodictyum humile* (P. Beauv.) Crum

(also *L. trichopodium*) - On soil, rocks, and decaying wood in wet, shady places like swamps, but often in

PLATE 9



lawns and meadows. Appomattox, Halifax, Prince Edward counties.

2. *Leptodictyum riparium* (Hedw.) Warnst.

On wet humus, leaf litter, decayed wood, and fallen twigs and branches in swamps, frequently in wet depressions. Buckingham, Lunenburg, Mecklenburg, Nottoway, Prince Edward counties. Plate 8.

46. *Leskea* Hedw.

Small creeping mosses in dull, dark green or brownish mats, freely to subpinnately branched, branches often ascending; paraphyllia few. Leaves ovate to ovate-lanceolate; midrib extending almost to apex, single; upper cells hexagonal, bulging, singly papillose. Setae long, cylindric, erect, symmetric or somewhat curved.

1a. Leaves somewhat longer than broad, often slightly asymmetric; capsules subcylindric, curved *L. polycarpa*

1b. Leaves not much longer than broad, not asymmetric; capsules oblong-cylindric, straight 2.

2a. Leaves rounded at apex *L. obscura*

2b. Leaves acute or bluntly-pointed at apex
..... *L. gracilescens*

1. *Leskea gracilescens* Hedw.

On bark, usually at the base of trees, less commonly on rocks or logs, in hardwood forests, swamps or along roadsides. Charlotte, Prince Edward counties. Plate 8.

2. *Leskea obscura* Hedw.

On bark at base of trees, rocks; swamps. Cumberland County.

3. *Leskea polycarpa* Hedw.

On bark at tree bases, occasionally on logs (in places subject to flooding). Lunenburg, Prince Edward counties.

47. *Leucobryum* Brid.

Medium-sized to large mosses, in dense, whitish, grayish or bluish-green cushions or clumps. Stems forked. Leaves crowded, thick, and fleshy. Setae long, red-brown; capsules curved, strongly inclined.

1a. Plants large, 2-10 cm high, leaves 3-9 mm long *L. glaucum*

1b. Plants smaller, 1-2 cm high, leaves 1-4 mm long *L. albidum*

1. *Leucobryum albidum* (Brid.) Lindb.

On moist rotten logs or stumps, less often on bark at base of trees (including pines!), soil, humus, or rock. Buckingham, Campbell, Charlotte, Halifax, Prince Edward counties.

2. *Leucobryum glaucum* (Hedw.) Angstr. ex Fries

On humus or soil in moist forests, often covering extensive low mounds, sometimes on logs or stumps or on bark at the base of trees; commonly in pine forests or mixed oak woods. Buckingham, Fluvanna, Halifax, Nottoway, Prince Edward counties. Plate 8.

48. *Leucodon* Schwaegr.

Robust creeping mosses in dull, dark green rigid tufts. Secondary stems simple or sparsely branched. Leaves ovate, dense, pressed to stem when dry, wide-spreading when moist; midrib lacking; cells smooth, thick-walled, rhombic above. Setae short to long, capsules mostly exserted, erect and symmetric, cylindric.

1a. Leaves not or obscurely creased, tightly overlapping when dry, ovate and somewhat abruptly narrowed to a tapering point; capsules usually shortly exserted *L. julaceus*

1b. Leaves longitudinally creased, erect or curving when dry; ovate and gradually narrowed to a long point; capsules usually immersed
..... *L. brachypus*

1. *Leucodon brachypus* Brid.

On bark of trees, rarely on logs, stumps, or rock. Buckingham, Campbell, Prince Edward counties. Plate 8.

2. *Leucodon julaceus* (Hedw.) Sull.

On trunks of trees, also on logs and stumps, occasionally on boulders. Campbell, Halifax, Mecklenburg, Nottoway, Prince Edward counties.

49. *Lindbergia* Kindb.

Slender, creeping mosses in loose, dull, rigid, dark-green to brownish mats. Stems irregularly branched. Leaves crowded, pressed to stem when dry, wide-spreading when moist, concave; midrib to mid-

leaf, cells smooth or unipapillose; brood branchlets common in clusters in axils of leaves along the stem. Setae long; capsules erect and symmetric.

***Lindbergia brachyptera* (Mitt.) Kindb.**

On trunks of trees, especially roadside elms and maples, occasionally on old logs or fence rails. Plate 9.

50. ***Mnium* Hedw.**

Medium-sized to robust, erect mosses in light to dark-green, brown, or reddish tufts, often hairy below. Stems simple or forked, erect (sometimes sterile stems spreading and somewhat flattened). Leaves elliptic, oblong, to round, contorted when dry, the margins usually bordered by linear cells, toothed; midrib nearly to apex; upper cells hexagonal to round. Setae long, capsules cylindric, pendulous (hanging).

- 1a. Leaves entire or indistinctly toothed 2.
1b. Leaves distinctly toothed 3.

- 2a. Leaves 3.5 - 7.0 mm long; stems clean, not fuzzy ***M. punctatum* var. *punctatum***
2b. Leaves 7-14 mm long; stems with fuzzy hairs ***M. punctatum* var. *elatum***

- 3a. Leaf border none or very obscure ... ***M. stellare***
3b. Leaf border clearly differentiated 4.

- 4a. Leaf border with teeth in pairs (side by side); leaves long and narrow; midrib ending below apex (except sometimes in uppermost leaves) ***M. hornum***
4b. Leaf border with single teeth 5.

- 5a. Leaves toothed only in upper half ***M. cuspidatum***
5b. Leaves sharply-toothed nearly to the base ... 6.

- 6a. Marginal teeth elongate, composed of 1-4 cells; sporophytes usually single at tips of stems ***M. affine* var. *ciliare***
6b. Marginal teeth composed mostly of single cells; sporophytes usually clustered at tips of stems ***M. medium***

1. ***Mnium affine* Bland. var. *ciliare* C. Muell.** (*Mnium ciliare* (C. Muell.) Schimp.) - On soil, humus, rotten wood, bark at the base of trees, and rock in moist shady places beneath trees or shrubs near streams.

Amelia, Lunenburg, Nottoway counties.

2. ***Mnium cuspidatum* Hedw.**

On moist soil or humus, decayed logs and stumps, bark at the base of trees or drainage channels in trunks, characteristic of banks and low mounds in hardwood forests, also commonly on poor lawns. Amelia, Buckingham, Campbell, Fluvanna, Prince Edward, Spotsylvania counties. Plate 9.

3. ***Mnium hornum* Hedw.**

On moist acid soil or rocks, especially in ravines and on banks of brooks, occasionally on rotten wood. Campbell, Prince Edward counties.

4. ***Mnium medium* BSG**

On wet rock and humus, rarely on the base of trees, in wet woods, often near brooks and springs. Prince Edward County.

5. ***Mnium punctatum* Hedw. var. *elatum* Schimp.**

In wet places in woods, around springs, in seepage zones and along streams. Appomattox, Mecklenburg, Nottoway, Spotsylvania counties.

6. ***Mnium punctatum* Hedw. var. *punctatum***

On wet, humic or mineral soil, humus, decayed wood, and rocks in swampy, coniferous woods, especially in depressions along streams and seepage near springs. Prince Edward County.

7. ***Mnium stellare* Hedw.**

On the base of trees and stumps and, less often, on soil of banks, rocks and rotten logs, in moist wooded places. Prince Edward County.

51. ***Orthotrichum* Hedw.**

Plants erect, small to robust, typically in small tufts, dark green or brownish with rhizoids at base, stems forked or forming branches in clumps. Leaves ovate lanceolate, acute, keeled; midrib strong, ending near apex; cells papillose. Setae short to long, capsules immersed to exserted, cylindric and often 8-ribbed when dry, erect, symmetric. The stomates of the capsule are important identifying characters and the capsules must be cut longitudinally, flattened, with spores removed before examination.

- 1a. Plants growing on concrete walls; capsules usually emerging from leaves ***O. strangulatum***

- 1b. Plants growing on trees 2.

- 2a. Capsules small, pale, smooth or faintly ribbed, not constricted beneath mouth when dry; leaf apex often minutely toothed *O. pusillum*
- 2b. Capsules darker, distinctly ribbed and usually contracted beneath the mouth when dry 3.
- 3a. Leaves short-pointed and sometimes sparsely toothed at apex; cells surrounding stomata of capsules not noticeably protruding *O. pumilum*
- 3b. Leaves not pointed or toothed at apex; cells surrounding stomata clearly protruding 4.
- 4a. Capsules dark brown, strongly ribbed and contracted below mouth when dry; cells surrounding stomata projecting horizontally *O. stellatum*
- 4b. Capsules straw-colored, narrowly and distantly ribbed and not or slightly contracted below mouth when dry; cells surrounding the stomata jutting steeply or vertically *O. ohioense*

1. *Orthotrichum ohioense* Sull. & Lesq. ex Aust
On bark of hardwood trees, especially those with smooth and hard bark; in hardwood forests, especially along streams. Halifax, Prince Edward counties.

2. *Orthotrichum pumilum* Sw.
On rough bark of trees (red maple, hickory, *Carpinus*) common in open forests or along roadsides; often on shade trees in towns. Campbell, Prince Edward counties.

3. *Orthotrichum pusillum* Mitt.
Bark of hardwoods, especially elms and other soft-barked trees, occasionally on red cedars, most commonly along roads or town streets. Prince Edward County.

4. *Orthotrichum stellatum* Brid.
In small tufts on trunks of hardwood trees principally in closed oak-hickory forests, also on logs, stumps, fence rails. Halifax, Prince Edward counties. Plate 9.

5. *Orthotrichum strangulatum* P. Beauv.
Normally on limestone boulders (which are lacking in study area) but occasionally collected on mortar or concrete walls. Prince Edward County (on wall).

52. *Paraleucobryum* (Lindb.) Loeske

Erect, robust mosses, in gray-green or yellow, shiny

tufts. Leaves erect to curved and turned to one side, lanceolate, forming tubes above; midrib broad (from 1/3 to 9/10 leaf base) filling most of tip; cells smooth, basal cells inflated. Setae long; capsules erect and symmetric, cylindric.

Paraleucobryum longifolium (Hedw.) Loeske
On granitic-type rocks in moist woods, less commonly on bark at base of trees or rotten wood; N-facing hemlock bluffs. Campbell, Charlotte counties. Plate 9.

53. *Philonotis* Brid.

Plants erect, small to moderately robust, usually in dense tufts, dull or bright or whitish-green to yellowish, with dense basal rhizoids. Stems forked or whorled below inflorescence. Leaves erect to spreading, ovate to lanceolate; midrib ending in leaf tip or extending beyond it; cells papillose at ends. Male inflorescences terminating branches and usually disk-like. Setae long, erect; capsules inclined to horizontal, almost spherical, asymmetric and ribbed.

1a. Leaf cells papillose at lower ends at back and at upper ends on inner surface; stems red *P. fontana*

1b. Leaf cells papillose only at upper ends; stems brownish to yellowish 2.

2a. Midrib ending in or just below leaf tip; leaf margins minutely singly-toothed in upper half. *P. muhlenbergii*

2b. Midrib extending beyond leaf tip in a short or long point; margins minutely toothed to leaf base *P. marchica*

1. *Philonotis fontana* (Hedw.) Brid.
On soil or rock in wet, seepy places, usually in the open around ditches, springs, streams. Campbell, Lunenburg, Prince Edward counties. Plate 9.

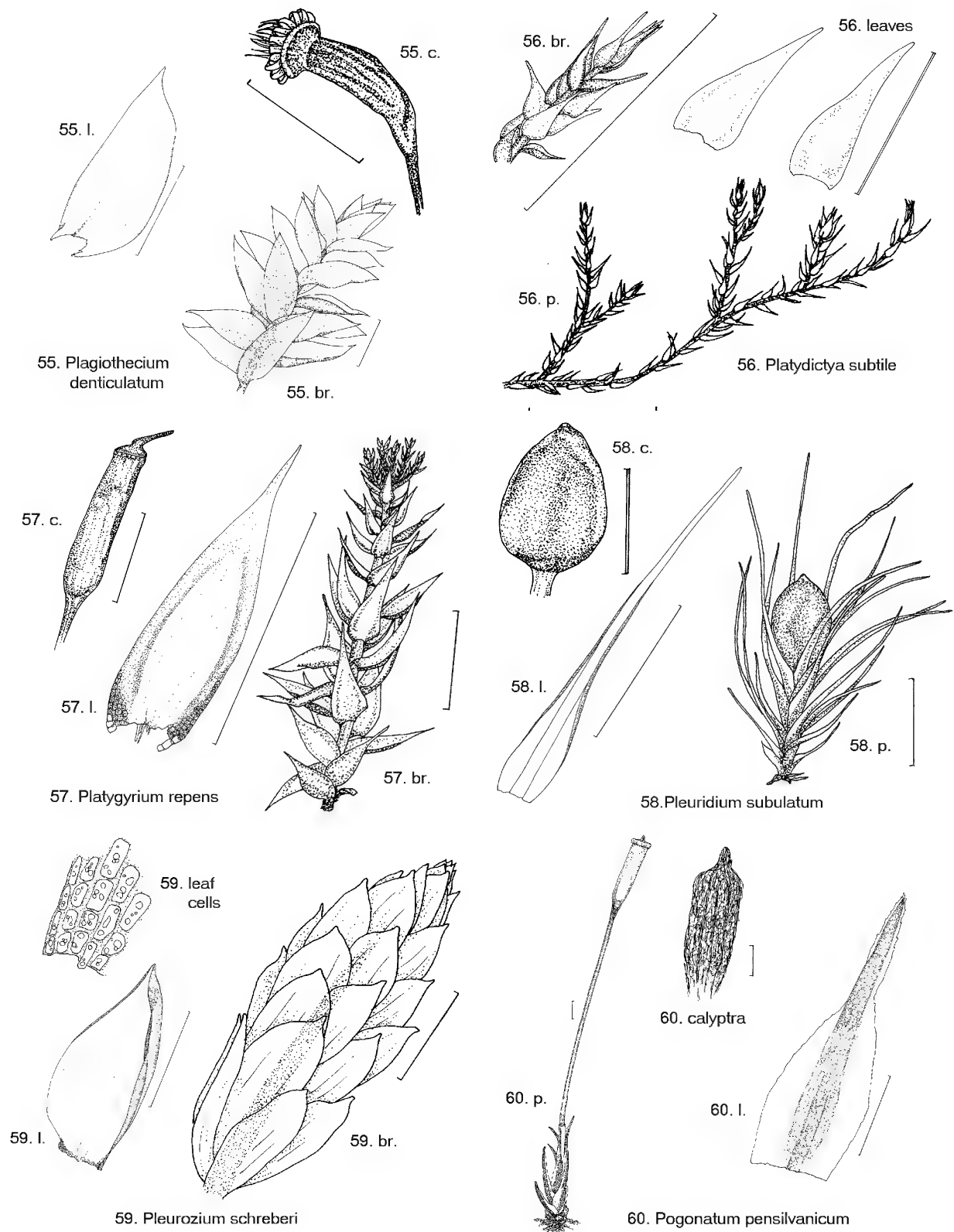
2. *Philonotis marchica* (Hedw.) Brid.
On soil in wet places, such as seepy roadbanks or edges of springs. Prince Edward County.

3. *Philonotis muhlenbergii* (Schwaegr.) Brid.
On soil in wet places. Amelia, Lunenburg counties.

54. *Physcomitrium* (Brid.) Furnr.

Small, erect mosses, growing close together, light

PLATE 10



green with simple or forked stems. Leaves erect or spreading, oblong-lanceolate; midrib ending below apex or, rarely, extending beyond; cells large and lax. Setae long, erect; capsules spherical to pear-shaped.

***Physcomitrium pyriforme* (Hedw.) Hampe**

Disturbed places on wet soil, banks of streams or ditches, in swamps, at roadsides, and in lawns, pastures and old fields in spring. Amelia, Appomattox, Buckingham counties. Plate 9.

55. ***Plagiothecium* BSG**

Plants creeping, irregularly pinnately branched, branches somewhat flattened in shiny, yellowish to bright or dark green mats. Leaves lanceolate to broadly ovate or elliptic; midrib short and double or lacking; cells linear, smooth. Setae long; capsules erect to horizontal.

- 1a. Leaves symmetric or nearly so, typically concave, not or only irregularly flattened (and if so, shrunken, contorted and scarcely overlapping when dry) ***P. cavifolium***
- 1b. Leaves asymmetric, flat, the plant distinctly flattened ***P. denticulatum***

1. ***Plagiothecium cavifolium* (Brid.) Iwats.**

On shaded soil or humus, sometimes on rotten wood or tree bases, usually in hardwood forests. Prince Edward County.

2. ***Plagiothecium denticulatum* (Hedw.) BSG**

In swamps, sometimes on rotten wood, bases of trees, soil or humus. Nottoway, Prince Edward counties. Plate 10.

56. ***Platydictya* Berk**

Small, slender, creeping mosses in green or brownish, dull, irregularly branched. Leaves very small, erect-spreading, lanceolate; cells short, rhombic, smooth. Setae long; capsules cylindric, erect, symmetric.

***Platydictya subtile* (Hedw.) Crum**

Bark at base of hardwood trees. Buckingham, Prince Edward counties. Plate 10.

57. ***Platygyrium* BSG**

Small creeping plants in flat, dark, golden- or brownish-green glossy mats, freely branched, the

branches ascending, bearing clusters of minute brood branchlets at tips. Leaves erect to spreading, concave, ovate to lanceolate, margins mostly entire; midrib short and double or lacking; cells smooth, rhombic in middle, quadrate in basal angles. Setae reddish, long; capsules erect and symmetric, cylindric.

***Platygyrium repens* (Brid.) BSG**

Common on logs and stumps, also on trunks or bases of trees; in dry wooded areas, moist hardwoods, and wet hardwood swamps. Campbell, Charlotte, Halifax, Prince Edward counties. Plate 10.

58. ***Pleuridium* Rabh.**

Small erect mosses, in loose, yellow-green or yellow-brown tufts. Leaves 1.5- 4 mm long, loosely erect or spreading, gradually tapering to apex from an ovate or oblong base, V-channeled to tubular at tip; midrib filling most of leaf tip; cells mostly linear, rectangular at base. Setae short; capsules immersed, elliptic to ovoid.

***Pleuridium subulatum* (Hedw.) Raben.**

A spring ephemeral on bare soil in lawns, old fields, cemeteries, grassy roadsides. Amelia, Appomattox, Buckingham, Prince Edward counties. Plate 10.

59. ***Pleurozium* Mitt.**

Robust creeping mosses in loose, light green or yellowish shiny mats, pinnately branched; stems red. Leaves loosely overlapping, concave, wrinkled when dry, broadly ovate, rounded at apex to point; midrib short and double; upper cells linear, smooth, basal cells oblong, orange. Setae long, red or yellow; capsules inclined to horizontal, curved to symmetric (not seen).

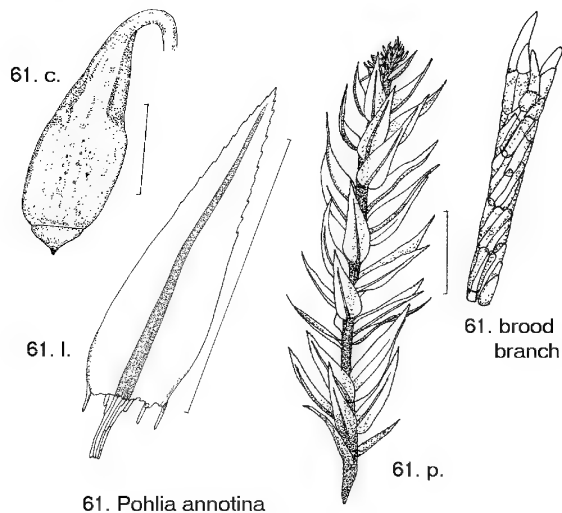
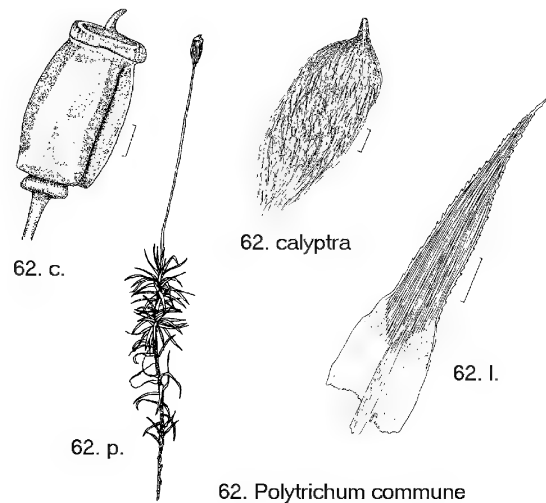
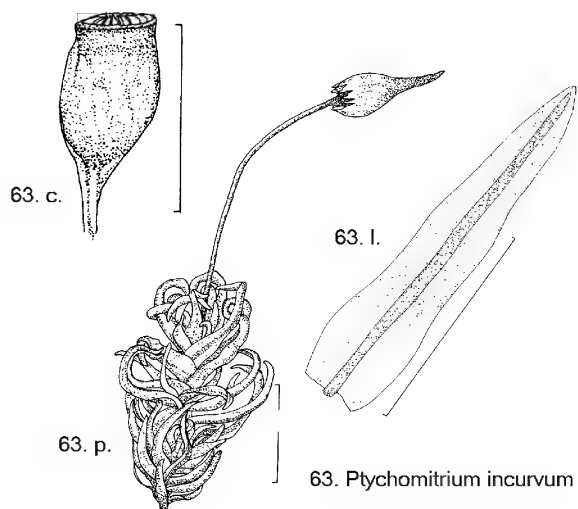
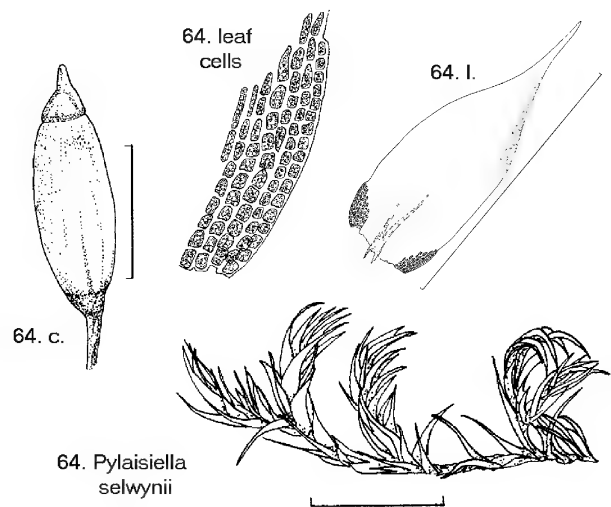
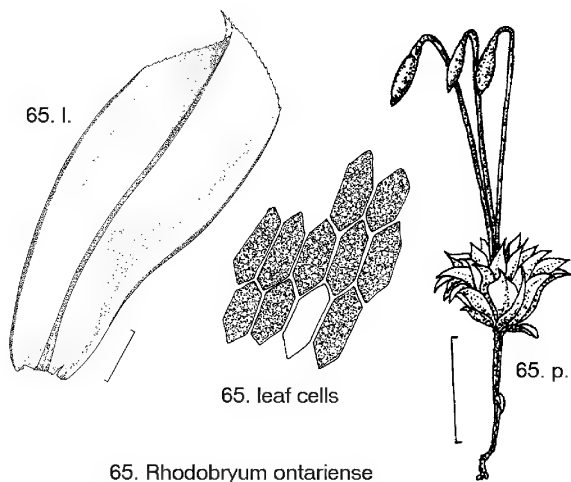
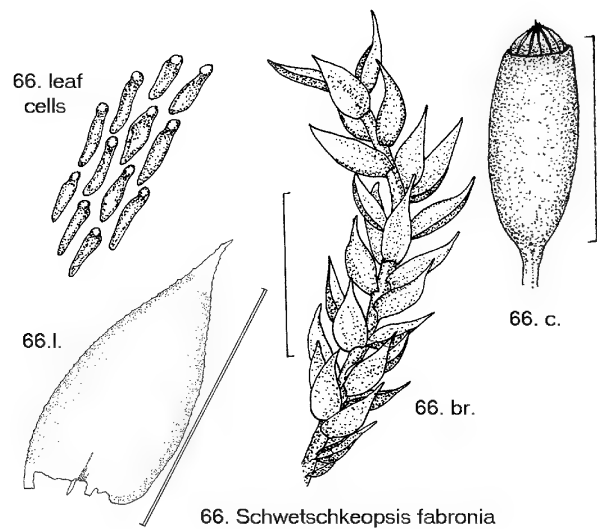
***Pleurozium schreberi* (Brid.) Mitt.**

On soil and humus in dry open woods (pines) and bogs; said to be an indicator of acid soils. Prince Edward County. Plate 10.

60. ***Pogonatum* P. Beauv.**

Small, erect mosses growing close together from a persistent green protonema (these two species only); leaves few, oblong or oblong-ovate with several erect lamellae (ridges of cells) on upper surface over midrib and leaf blade. Setae long; capsules cylindric, symmetric or somewhat asymmetric, erect or inclined to horizontal.

PLATE 11

61. *Pohlia annotina*62. *Polytrichum commune*63. *Ptychomitrium incurvum*64. *Pylaisiella selwynii*65. *Rhodobryum ontariense*66. *Schwetschkeopsis fabronia*

- 1a. Leaves irregularly notched to toothed on margins; lamellae few, 11-16 *P. pensilvanicum*
 1b. Leaves entire; lamellae many, 25-39, covering most of leaf surface *P. brachyphyllum*

1. *Pogonatum brachyphyllum* (Michx.) P. Beauv.
 On bare sandy or clayey soil on banks of ditches or ravines, usually in open situations. Prince Edward, Spotsylvania counties.

2. *Pogonatum pensilvanicum* (Hedw.) P. Beauv.
 A pioneer of recently exposed, steep banks of moist clay or silt, especially on roadbanks. Buckingham, Prince Edward counties. Plate 10.

61. *Pohlia* Hedw.

Plants erect, small to fairly robust, in loose or dense green, yellowish, or rarely, reddish, sometimes glossy tufts; stems usually red. Leaves crowded at stem tips, erect, lanceolate, toothed near tips; midrib ending below or at apex; upper cells long and narrow, lower cells shorter and rectangular. Setae long, twisted, often curved above; capsules inclined or drooping, ovoid or cylindric, each with a neck.

- 1a. Plants producing twisted, elongated, top-shaped brood bodies in leaf axils; stems red below and green above *P. annotina*
 1b. Plants not producing brood-bodies; capsules elongate; upper leaf cells rhombic, thick-walled; stems red throughout *P. nutans*

1. *Pohlia annotina* (Hedw.) Lindb.
 On soil in moist open places along ditches. Prince Edward County. Plate 11.

2. *Pohlia nutans* (Hedw.) Lindb.
 On turfy soil, decaying logs and tops of rotten stumps; also rock crevices. Appomattox, Lunenburg, Spotsylvania counties.

62. *Polytrichum* Hedw.

Robust, erect mosses in loose or dense, dark, green, brownish or bluish-green tufts. Leaves lanceolate from a sheathing base, spreading, usually with a long point at tip, the upper blade covered from base to apex by many erect lamellae (files of cells); margins plane or abruptly folded inward, entire or coarsely toothed;

midrib strong, continuing into the long pointed tip. Setae long, erect; capsules almost erect to horizontal, 4 - 6 angled in cross-section, gradually or abruptly narrowed to a swollen base, calyptra densely covered with brown to tan hairs. These are known as the "hair-cap" mosses.

- 1a. Leaf margins entire, thin and infolded; leaf tip forming a toothed, red-brown awn *P. juniperinum*
 1b. Leaf margins coarsely toothed, not infolded 2.
 2a. Capsules cubical; plants robust, 4-4.5 cm tall; terminal cell of lamellae, in leaf cross-section, notched *P. commune*
 2b. Capsules much longer than broad; plants smaller, 1.5 - 6 cm tall; terminal cell of lamella, in section, rounded or flat-topped, never notched *P. ohioense*

1. *Polytrichum commune* Hedw.
 Large plants on soil, humus, and rocks in wet habitats, in pastures and meadows, and at the edges of bogs and swamps. Amelia, Appomattox, Lunenburg, Prince Edward counties. Plate 11.

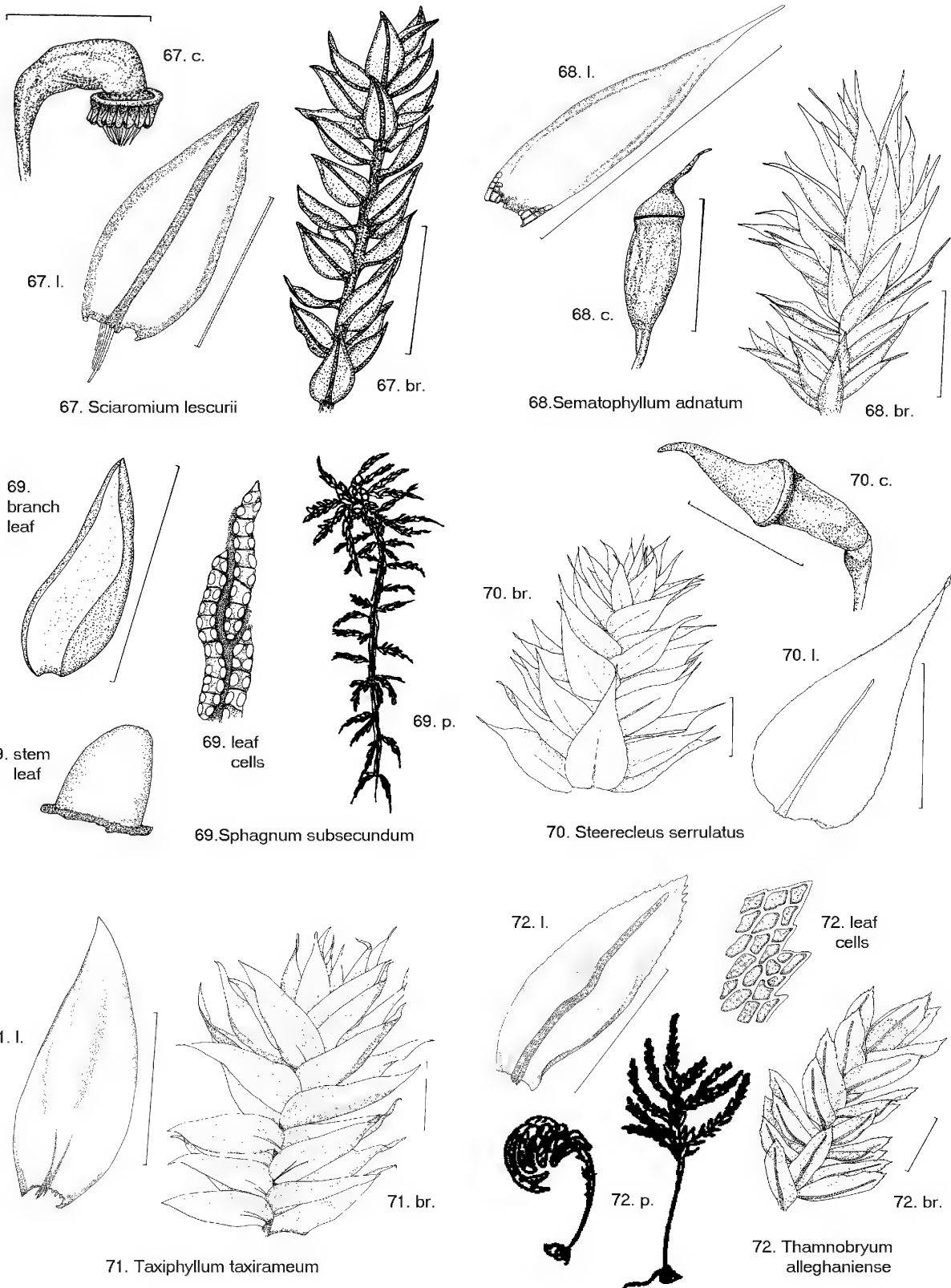
2. *Polytrichum juniperinum* Hedw.
 On soil, humus, and rocks in dry to moist hardwood forests, especially in pine-oak forests. Amelia, Prince Edward counties.

3. *Polytrichum ohioense* Ren. & Card.
 On soil or humus (often overlying rock), sometimes on stumps, characteristic of banks or sides of trails or at bases of trees in rather dry, open woods or pastures (rarely in moist woods). Amelia, Buckingham, Campbell, Prince Edward, Spotsylvania counties.

63. *Ptychomitrium* Fuernr.

Small erect mosses in loose or dense, dull, dark green cushions. Leaves erect with curved points or crisped when dry, spreading when moist, concave and long-lanceolate from a broad sheathing base, blunt or acute, margins entire to faintly toothed near apex; midrib strong, ending in or below apex; upper cells small, rounded to quadrate, smooth; lower cells linear to laxly oblong. Setae long, yellowish; capsules erect and symmetric, ovoid to cylindric.

PLATE 12



- 1a. Leaves erect and slightly incurved when dry, notched-finely toothed above; growing on bark of trees or on old wood *P. drummondii*
 1b. Leaves crisped and contorted when dry, entire; growing on rock *P. incurvatum*

1. *Ptychomitrium drummondii* (Wils.) Sull.

On tree trunks, including their bases, especially on elms and cedars, along streams; often on trunks of shade trees along streets of towns.

2. *Ptychomitrium incurvatum* (Schwaegr.) Spruce
 On rocks of all types; common in crevices of boulders in hardwood forests. Amelia, Nottoway, Prince Edward counties. Plate 11.

64. *Pylaisiella* Kindb.

Plants creeping in slender or medium-sized, flat, light to dark green or brownish shiny mats; irregularly to pinnately branched, branches ascending, usually curved. Leaves crowded, spreading when moist, concave, ovate-lanceolate, with short- to long-tapering tips; midrib short and double; cells linear, small and quadrate in rows at basal angles. Setae long; capsules erect and symmetric, cylindric to ovoid.

- 1a. Quadrate basal cells of leaves few, less than 10 at margins *P. intricata*
 1b. Quadrate basal cells numerous, 10-20 or more along margins *P. selwynii*

1. *Pylaisiella intricata* (Hedw.) Grout

On trunks of hardwoods and red cedars, rarely on logs. Buckingham, Prince Edward counties.

2. *Pylaisiella selwynii* (Kindb.) Crum, Steere & Anders. - On trunks of hardwoods and red cedars, rarely on logs. Halifax, Prince Edward counties. Plate 11.

65. *Rhodobryum* (Schimp.) Hampe

Robust, dark green, erect mosses from a subterranean, rhizome-like stem; erect stems forming rosettes at their tips (like green flowers); leaves distant, small and scale-like below, larger and crowded at stem tips, wide spreading when moist, contorted when dry, oblong-obovate, broadly acute and abruptly pointed, bordered and toothed on margins above; midrib strong, ending in apex or forming a short point; upper cells large, oblong-hexagonal, lower cells elongate-rectangular.

Setae long, single or clustered, hooked or curved at the tip; capsules horizontal to hanging, curved, cylindric, the neck usually conspicuous.

Rhodobryum ontariense (Kindb.) Par. in Lindb.

[*Rhodobryum roseum* (Hedw.) Limpr.] - On shaded humus or soil over rocks, also on old logs or bark at the base of trees. Buckingham, Prince Edward counties. Plate 11.

66. *Schwetschkeopsis* Broth.

Slender, small, creeping mosses, freely branched, the branches often tapering in soft, dense, slightly shiny, green or yellow-green mats; leaves erect, crowded, ovate-lanceolate, tapering to a slender apex, lacking a midrib, minutely toothed all around; upper cells rhombic, thick-walled, papillose at back because of projecting upper ends, basal marginal cells quadrate in several rows. Setae elongate; capsules erect and symmetric, cylindric.

Schwetschkeopsis fabronia (Schwaegr.) Broth.

On bark of hardwoods, especially on trunks of smooth-barked trees. Predicted (Crum & Anderson, 1981) but not yet found in this area. Plate 11.

67. *Sciaromium* (Mitt.) Mitt.

Coarse and rigid, creeping plants of moderate size, in loose, dull, yellow-green or dark, dingy green mats, freely branched, branches erect. Stems frequently lacking leaves in older parts, leaves somewhat concave, ovate, incurved and twisted when dry, spreading when moist, bordered by several rows of thick-walled cells in 2 or more layers; midrib strong, ending in leaf tip or extending slightly; cells rhombic to hexagonal, basal cells not much differentiated. Setae elongate; capsules strongly inclined to hanging, curved and asymmetric, contracted below mouth when dry.

Sciaromium lescurii (Sull.) Broth.

On wet rocks in streams, sometimes in cascades. Buckingham County. Plate 12.

68. *Sematophyllum* Mitt.

Small to medium-sized creeping mosses, in dense, dull or shiny, green to yellowish or brownish mats; somewhat pinnately branched, the branches ascending and often curved. Leaves erect or spreading, asymmetrically curved to one side, concave, lanceolate

to ovate, acute to shortly drawn out at tips; midrib absent or short and double; cells mostly linear, smooth, 3-6 cells at basal angles abruptly inflated and yellow. Setae long; capsules erect and symmetric to horizontal and curved, contracted below mouth when dry.

- 1a. Leaves oblong-lanceolate, gradually narrowed to tip; capsules erect or nearly so; on bark of trees or logs *S. adnatum*
- 1b. Leaves oblong-ovate, acute or shortly narrowed to tip, capsules inclined to nearly horizontal; on rocks *S. demissum*

1. *Sematophyllum adnatum* (Michx.) E.G. Britt.
On bark at the base of trees, logs, rarely, rock or soil; commonly in swamps, but also pine-oak forests, or hemlock stands on N-facing bluffs. Appomattox, Charlotte, Prince Edward counties. Plate 12.

2. *Sematophyllum demissum* (Wils.) Mitt.
Wet acid rocks near streams. Buckingham, Charlotte, Prince Edward counties.

69. *Sphagnum* L.

Sphagnum, the peat mosses, is sometimes a difficult genus to identify because of the technical nature of characters used for identification. Fortunately we have few species on the Piedmont, some of which can be identified through field characteristics. Even so, the leaves may need to be sectioned across their width with a clean, sharp razor blade. Staining with a solution of crystal violet gives good contrast. The convex surface is the upper, and the concave is the lower surface.

Robust mosses, growing in wet places or seepage. Stems erect, sparsely forked, the central woody cylinder surrounded by 1 or more layers of clear, thin-walled epidermal (cortical) cells. Branches usually in clusters, but crowded at stem tip in a head-like tuft. Leaves spirally arranged around branches, composed of linear, green cells in a network surrounding large, empty, rhombic, clear cells, nearly always reinforced by thickened fibrils, usually with large rounded pores. Stem leaves different from branch leaves, less crowded, often larger or of different shapes. Capsules spherical, black when fresh, elevated on an elongated branch, but collapsed, dry and cylindric when empty. [Five additional species of *Sphagnum* are known from Piedmont counties bordering the Fall Line. These are *S. bartlettianum*, *S. cuspidatum*, *S. magellanicum*, *S. recurvum*, and *S. tenerum*. Users may wish to consult

a more thorough treatment of this genus for identification purposes. – Ed.]

- 1a. Branch leaves hood-shaped at apex 2.
- 1b. Branch leaf margins inrolled or flat but not hood-shaped; branch leaves not curved backwards when wet; leaves with a border of narrow linear cells 5.
- 2a. Stem leaves small and triangular, <1 mm long (branch leaves somewhat standing away from branch when moist), plants pale brownish green, sometimes tinged with violet; leaves very narrowly bordered by linear cells *S. compactum*
- 2b. Stem leaves large, >1 mm long, tongue shaped; branch leaves tightly or loosely overlapping; plants green, yellow, or brown but not red; leaves not bordered 3.
- 3a. Tufted head of moss small and distinctly flattened with small pointed branches; plants green, reddish brown in capitulum; newest branches in capitulum noticeably shorter than branches below *S. henryense*
- 3b. Head large and rounded; plants green, brown, purple brown; newest branches not noticeably shorter than older branches 4.
- 4a. Stem leaves >1.5 mm long with length almost twice the width; plants green to golden-brown; growing in margins of mineral rock habitats, rarely dominant *S. palustre*
- 4b. Stem leaves < 1.5 mm long and only slightly longer than broad; branch leaves frequently standing away from branch; plants slender overall; plants green, tinged with brown or purple brown *S. affine*
- 5a. Stem leaves 0.5 - 1.0 mm long; branch leaves slightly curved to one side, stem dark brown *S. subsecundum*
- 5b. Stem leaves >1.0 mm long; branch leaves rarely curved to one side; stem and branch leaves noticeably different in size and structure *S. lescurii*

1. *Sphagnum affine* Ren. & Card.
(also *S. imbricatum* Hornsch. ex Russ.) - In loose wide mats in seepage areas or small streams in pine-oak-hickory forests. Prince Edward County.

2. *Sphagnum compactum* DC ex Lam. & DC

In small cushions on wet sandy silt and moist rock; on moist hemlock bluff. Fluvanna County.

3. *Sphagnum henryense* Warnst.

In loose carpets and low cushions on peaty humus in wooded or shrubby swamps, at the edges of ponds or along streams, rarely submerged.

4. *Sphagnum lescurii* Sull.

(also *S. subsecundum* Nees ex Sturm. var. *rufescens* Nees) - On wet soil at the margins of creeks and ponds, also in meadows and shaded swamplands. Lunenburg, Prince Edward counties.

5. *Sphagnum palustre* L.

Forming wide carpets in more or less mineral-rich, swampy habitats, usually in shade in hardwood swamps. Not yet found in Piedmont but suggested as present by Crum & Anderson (1981).

6. *Sphagnum subsecundum* Nees ex Sturm.

In wet sedgy habitats, in seepage or among rocks. Plate 12. [*Sphagnum subsecundum*, in the strict sense, is generally regarded as a rare species of the north extending south to the mountains of North Carolina. That plant is not presently known in Virginia. The basis for Dr. Breil's inclusion of this name is unknown. - Ed.]

70. *Steerecleus* Robins.

Creeping mosses of moderate size, in flat, shiny, bright or yellow-green mats; irregularly branched. Leaves not crowded, spreading and flattened on stems, about 2 mm long, ovate, narrowed to a slender, twisted apex; margins minutely toothed, often to base; cells linear, cells of basal angles not differentiated. Setae long, yellow, becoming brown or reddish; capsules inclined to horizontal, cylindric, strongly curved when dry, brown.

Steerecleus serrulatum (Hedw.) Robins.

[*Rhynchostegium serrulatum* (Hedw.) Jaeg. & Sauerb.] On soil or humus, rotten wood, bark at base of trees, and rock in rather dry to moist hardwood forests, sometimes in lawns and grassy fields. Buckingham, Campbell, Fluvanna, Halifax, Prince Edward, Spotsylvania counties. Very common. Plate 12.

71. *Taxiphyllum* Fl.

Creeping mosses in flat, small to medium-sized, green or yellow, often glossy mats; branching irregular to subpinnate; small lance-like leaves surrounding branch bases or branch initials. Leaves crowded, ovate, with gradually drawn out tips, leaves apparently flattened into 2 rows; margins toothed all around; midrib short and double or lacking; cells linear, the upper ends sometimes minutely projecting, cells shorter at apex and base. Setae long; capsules erect or inclined; oblong or ovoid.

Taxiphyllum taxirameum (Mitt.) Fleisch.

On soil or rock. Plate 12.

72. *Thamnobryum* Nieuwl.

Plants robust, in rigid, loose, dull mats; primary stems creeping, leafless; secondary stems ascending and freely, often pinnately branched above; often tree-like; paraphyllia none. Leaves ovate, not or rarely flattened, blunt to acute or drawn-out at apex, toothed above; midrib stout, usually ending below apex; cells smooth, rounded-quadrate to rounded-hexagonal, longer toward base. Setae long; capsules cylindric, inclined to horizontal or drooping.

Thamnobryum alleghaniense (C.M.) Nieuwl.

On rocks in wet, shady, cooler ravines and on north-facing bluffs. Buckingham, Prince Edward counties. Plate 12.

73. *Thelia* Sull.

Medium-sized creeping mosses in dark green to yellowish or grayish mats; irregularly or pinnately branched, branches usually cylindric often ascending; paraphyllia few to many. Leaves densely overlapping, concave, triangular-ovate, abruptly drawn to a point at apex; margins regularly to irregularly sharply toothed, the teeth sometimes branched; midrib single, ending above leaf middle; cells rhombic and coarsely singly papillose at back; papillae long and simple or elaborately branched. Setae yellow to red-yellow; capsules erect, symmetric, cylindric.

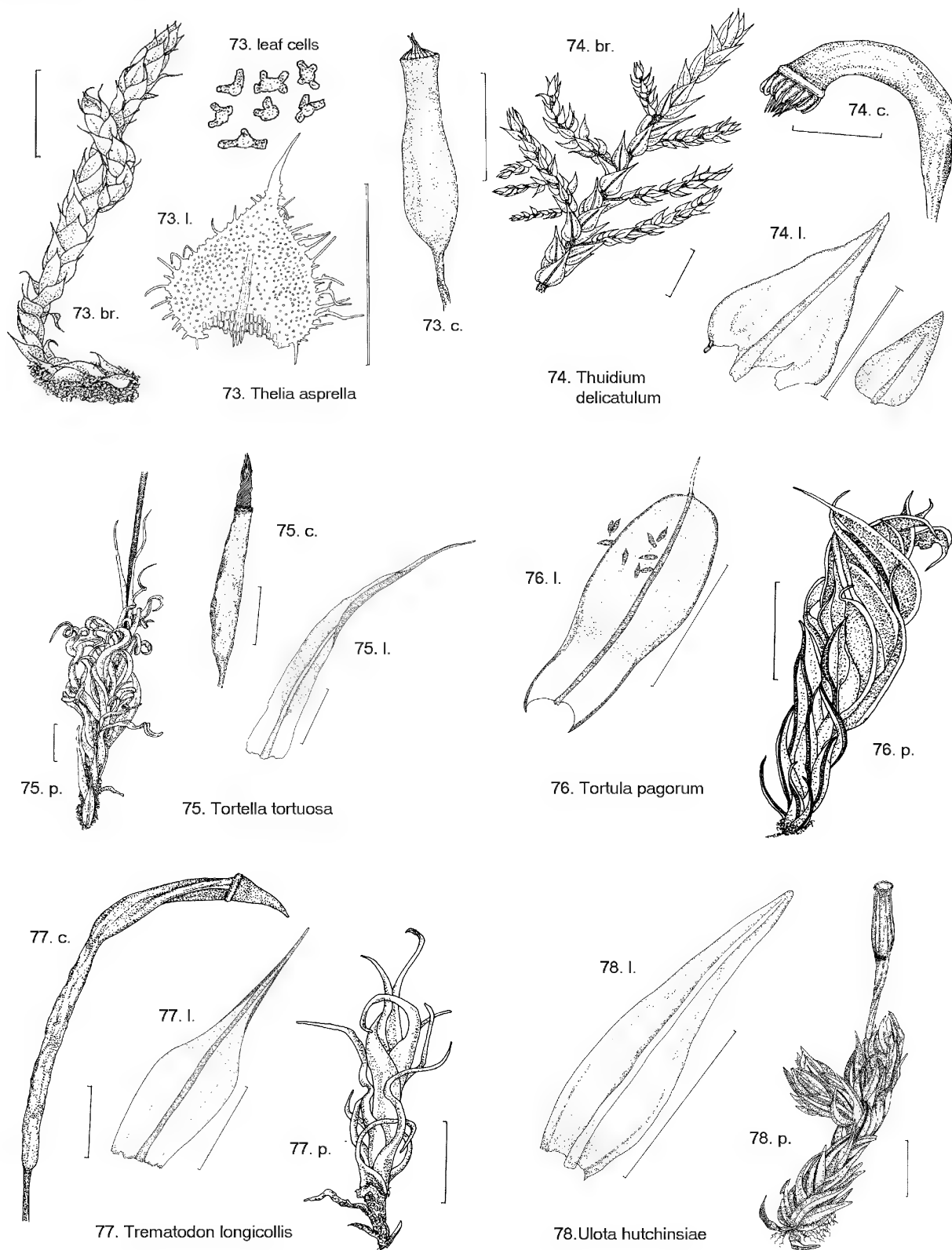
1a. Leaf cells with simple papillae; on trees

..... *T. hirtella*

1b. Leaf cells with elaborately branched papillae

2.

PLATE 13



- 2a. Stems creeping, covered with rhizoids; on trees *T. asprella*
 2b. Stems crowded and ascending, not or only slightly covered with rhizoids; on sandy soil *T. lescurii*

1. *Thelia asprella* Sull.

On bark at base of trees, sometimes on rotten logs and stumps, rarely on soil. Buckingham, Charlotte, Fluvanna, Prince Edward, Spotsylvania counties. Plate 13.

2. *Thelia hirtella* (Hedw.) Sull.

On bark at base or on trunks of hardwood and red cedar trees; sometimes on decayed logs and stumps; rarely on rock or soil. Buckingham, Nottoway counties.

3. *Thelia lescurii* Sull.

On soil, especially sand, occasionally rocks, rarely on bark at base of trees, in dry open areas such as cedar, pine, or oak barrens and oak-hickory woods. Appomattox, Prince Edward counties.

74. *Thuidium* BSG

Robust, creeping mosses in dull, green, yellowish, or brownish, loose mats. Stems creeping to ascending, often curved; regularly 2-3 pinnate; paraphyllia abundant, papillose, often polymorphic. Stem leaves larger than branch leaves. Leaves ovate, tapered to tip and narrowed at base, usually with 2 pleats lengthwise, margins revolute below; midrib usually ending below apex, sometimes extending into it; cells mostly uniform, rounded, hexagonal, thick-walled, minutely multipapillose on one or both surfaces; tips of branch leaves ending in a cell with 2 or more terminal papillae. Setae long; capsules inclined to horizontal, curved, cylindric.

- 1a. Stem leaves incurved at base and wide-spreading at tips, midrib nearly filling tip; (perichaetial leaves surrounding base of sporophyte) not ciliate on margins *T. recognitum*
 1b. Stem leaves erect, with margins recurved and midrib ending well below apex; perichaetial leaves ciliate on margins *T. delicatulum*

1. *Thuidium delicatulum* (Hedw.) BSG

On moist shaded soil, humus, rock, logs or stumps, less commonly on bark at the base of trees, or even well up the trunks in moist places, apparently more

often on acid substrates than *T. recognitum*. Buckingham, Campbell, Fluvanna, Lunenburg, Prince Edward, Spotsylvania counties. Plate 13.

2. *Thuidium recognitum* (Hedw.) Lindb.

On moist soil or humus and rocks, infrequently on logs or bark at the base of trees, usually in woods, sometimes in meadows, forest clearings, or timber trails.

75. *Tortella* (Lindb.) Limpr.

Small to medium-sized erect mosses, growing in loose or dense, green, yellowish or brownish tufts. Leaves curled and contorted when dry, spreading when moist, oblong-lanceolate to linear-lanceolate; midrib strong, ending in tip to extending beyond; upper cells round to hexagonal, green, obscure, densely papillose on both surfaces; lower cells lax, rectangular, clear, abruptly set off from the upper cells in a V-shaped region extending above the shoulders in a short to elongate border. Setae elongate, becoming reddish; capsules erect and symmetric or somewhat curved, cylindric; peristome teeth long and twisted.

- 1a. Leaves 4-6.5 mm long, gradually long-narrowed, with tips spirally curled when dry; on concrete or mortared walls *T. tortuosa*
 1b. Leaves 2-4 mm long, more abruptly pointed, irregularly incurved and contorted when dry; on trees *T. humilis*

1. *Tortella humilis* (Hedw.) Jenn.

On bark at the base of trees or on rock, soil, humus, or logs, generally in dry places. Amelia, Buckingham, Nottoway, Prince Edward counties.

2. *Tortella tortuosa* (Hedw.) Limpr.

Normally on limestone, this has been found locally on concrete walls. Prince Edward County. Plate 13.

76. *Tortula* Hedw.

Small, erect mosses, in dull, green to brownish tufts, often tinged with red, simple or forked, with many rhizoids below. Leaves often larger and more crowded toward stem tips, wide-spreading to recurved when moist, erect, folded along midrib and twisted around stem when dry, strap-shaped, elliptic and widest above the middle, broadly rounded to obtuse at tips, ending in long awns; margins entire; midrib strong, usually extending into long awn; upper cells hexagonal,

multipapillose, the papillae circular or C-shaped; lower cells large, rectangular, thin-walled, smooth, clear. Setae long; capsules cylindric, erect and symmetric to somewhat curved, peristome teeth developing 32 long filaments that are spirally wound.

- 1a. Plants developing propagula in axils of leaves; on trees *T. pagorum*
 1b. Plants not producing propagula or brood bodies; on rock or concrete walls... *T. muralis*

1. *Tortula muralis* Hedw.

On mortared brick or stone walls, concrete abutments and storm drains and limestone in natural habitats. Prince Edward County.

2. *Tortula pagorum* (Milde) De Not.

On bark of trees especially near habitation, sometimes on rocks, bricks, or stone walls. Farmville, Prince Edward County (courthouse trees). Plate 13.

77. *Trematodon* Michx.

Small, erect plants, loosely associated or tufted, light green or yellowish. Leaves spreading when moist, curled when dry, oblong-ovate and clasping at base, gradually to abruptly narrowed to a linear tip; midrib extending to tip but not filling awn; cells short-rectangular above, laxly rhombic to rectangular below. Setae long; capsule with neck twice as long as urn.

Trematodon longicollis Michx.

On damp sand or clay of banks (particularly roadside ditches), also on soil of bottomlands, old fields, and lawns, burned areas. Prince Edward County. Plate 13.

78. *Ulota* Mohr ex Web.

Small erect mosses, in small tufts, green, yellowish or brownish above, dark brown to blackish and covered in rhizoids below. Leaves crowded, slightly curved or crisped and contorted when dry, spreading when moist, lanceolate from a broader concave base and gradually narrowed to a slender, bluntly acute apex; midrib ending near apex; upper cells round, thick-walled, smooth to obscurely unipapillose on both surfaces; cells of sheathing base linear, arranged in a radiating pattern, yellowish, very thick-walled. Setae terminal, elongate; capsules cylindric, 8-ribbed, erect, with a relatively long, tapering neck; calyptra hairy.

- 1a. Plants growing on rock; leaves slightly curved, but not crisped or contorted when dry *U. hutchinsiae*
 1b. Plants growing on trees; leaves very crisped and contorted when dry *U. crispa*

1. *Ulota crispa* (Hedw.) Brid.

On bark of trees, usually hardwoods. Expected but not yet collected.

2. *Ulota hutchinsiae* (Sm.) Hamm.

On siliceous rocks, usually boulders in mesic hardwood forests. Prince Edward County. Plate 13.

79. *Weissia* Hedw.

Small dull green, yellowish or brownish mosses, in loose or dense tufts. Leaves larger toward stem tips, strongly curled and contorted when dry, spreading when moist, narrowly lanceolate from a narrow oblong base, the apex acute, margins inrolled from the shoulders to the apex; midrib shortly extending beyond tip as a fine point; upper cells small, hexagonal, densely papillose, lower cells smooth, rectangular, pale. Setae long; capsules erect and symmetric, ellipsoidal to cylindric.

Weissia controversa Hedw.

Common and weedy, on soil or rock in open disturbed places such as roadsides and abandoned fields, lawns. Appomattox, Buckingham, Charlotte, Halifax, Prince Edward counties. Figure 2.

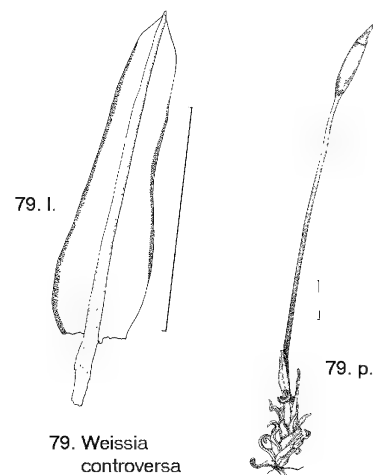


Fig. 2.

ACKNOWLEDGMENTS & NOTE

The botany editor thanks Dr. Jonathan Shaw, bryologist at Duke University, for the much needed overview of technical content. His review was invaluable. Sue Williams also reviewed the original draft and made helpful comments. In addition to her fine illustrations, she deserves special thanks for making her original drawings available to the botany editor in high resolution, digital format, greatly facilitating the production of Plates. Technical support was provided by the New Media Center at Virginia Tech. Special thanks to Rob Dickert at Computer Lab Support at Virginia Tech for converting the original text files to a current, usable format. Steve Roble made helpful suggestions along the way and was a great encouragement.

A concerted effort has been made to preserve the original intentions of the author in bringing this paper to completion, however, discrepancies between various portions of the draft needed to be resolved without the benefit of feedback from the author. As the title indicates, this paper treats common and occasional mosses. Users will undoubtedly encounter species not included herein, but it is hoped that Dr. Breil's efforts will spur many a curious naturalist to enjoy these beautiful little plants. TFW, Botany Editor.

GLOSSARY

acrocarpous - with gametophyte producing sporophyte at apex of a stem or main branch. Acrocarpous mosses generally grow erect in tufts (rather than mats) and are sparsely or not branched (as opposed to pleurocarpous)

acute - sharp pointed, with terminal angle less than 90° but greater than 45°

alar cells - referring to cells at basal margins (angles) of a leaf; these cells are often differentiated in size, shape or color from other leaf cells, e.g., *Dicranum*.

apical - at apex; summit or point of a structure

basal cell - cell at the base; in leaves, frequently differentiated cells of the lower 1/4 - 1/3 of a leaf

brood body - a generalized term used to denote various types of specialized vegetative reproductive structures; e.g., reduced buds, leaves, branches or plant fragments (propagules)

brood branch – see cladium

calyptra (pl. calyptrae) - a membranous covering of haploid tissue over the developing sporophyte (generally remaining attached as a cap atop the capsule)

capsule - the sporangium; terminal spore-producing part of the sporophyte; in most mosses it is differentiated into an apical operculum, central urn (spore-bearing region) and a sterile basal neck

cladium (pl. cladia) - modified, regenerant branch that arises from normal shoots and detaches readily for vegetative reproductive purposes

costa (pl. costae) - nerve or midrib of a leaf, always more than one cell thick

crisped (crispate) - wavy; often used more loosely to mean variously curled, twisted, and contorted

decurrent - with basal leaf margins extending down the stem past the leaf insertion as ridges or narrow wings

exserted - projecting and exposed; e.g., capsules or perianths held clear of the tips of perichaetial leaves (cf. emergent)

falcate - curved like the blade of a sickle

fibril - fine, fiber-like wall thickenings

filiform - slender and elongate, filamentous, thread-like

foliose - leafy or leaf-like; closely covered with leaves

gametophyte - the haploid, sexual generation; the dominant generation in mosses, consisting normally of green, leafy plants

gemma (pl. gemmae) - uni- or multicellular, filamentous, globose, ellipsoidal, cylindric, stellate or discoid brood bodies, relatively undifferentiated, serving in vegetative reproduction

globose - spherical

immersed - submerged or below the surface; referring to a capsule or perianth exceeded by the blades or awns

of the perichaetial leaves (cf. exserted)

insertion - the place or line of attachment of a structure; applied to leaves and branch on a stem, peristome, etc.

lamella (pl. lamellae) - parallel photosynthetic ridges or plates along a leaf blade, costa or thallus

median - central, middle; e.g., median leaf cells are from the upper middle of a leaf, midway between costa and margin

midrib - a mid-vein or single costa of a leaf or thallus

neck - the sterile basal portion of a capsule, sometimes considerably differentiated

operculum (pl. opercula) - the lid covering the mouth of most moss capsules

papilla (pl. papillae) - cell ornamentation, a solid microscopic protuberance

papillose - bearing papillae; monopapillose - bearing one simple, unbranched papilla on the cell surface multipapillose - bearing several papillae, or one compound or branched papilla on the cell surface. Loosely applied to any minutely rough surface

paraphyllium (pl. paraphyllia) - small green outgrowths of various shapes, i.e., filiform, lanceolate, scale- or leaf-like or sometimes branched; produced randomly on the stems or branches of many pleurocarpous mosses

perichaetial leaf - modified leaf or underleaf (bract; bracteole) associated with the gynoeceium (female sexual organ); collectively forming the perichaetium

peristome - a circular structure, generally divided into 4, 8, 16, 32, or 64 teeth, arranged in a single or double (rarely multiple) row around the mouth of a capsule

pinnate - with numerous, spreading branches on opposite sides of the axis and thus resembling a feather

pleurocarpous - producing sporophytes laterally from a perichaetial bud or a short, specialized branch rather than at the stem tip; with stems usually prostrate, creeping, and freely branched, thus mosses growing in mats rather than tufts

propagulum (propagule) - reduced bud, branch, or leaf serving in vegetative reproduction (see brood body)

protonema (pl. protonemata) - a filamentous, globose or thalloid structure resulting from spore germination and including all stages of development up to the production of one or more gametophytes; in mosses the protonema is typically filamentous although *Sphagnum*, *Andreaea*, and *Tetraphis* have thallose protonemata

pseudoparaphyllium (pl. pseudoparaphyllia) - small, unistratose (one cell layer thick), filiform or foliose structure resembling paraphyllium, but restricted to the areas of the stem around branch primordia; often found in pleurocarpous mosses

recurved - curved downward and inward; in leaves, referring to margins, apices, or marginal teeth

rosette - a compact cluster of leaves encircling the stem

secund - turned to one side; e.g., leaves on a stem

seta (pl. setae) - elongated portion of the sporophyte between the capsule and foot; loosely used for axillary bristles

sporophyte - the spore-bearing generation; initiated by the fertilization of an egg; remaining attached to the gametophyte and partially dependent on it; typically consisting of foot, seta, and capsule

thallus (pl. thalli) - a more or less flattened gametophyte, not differentiated into a stem and leaves

unipapillose - with a single papilla per cell

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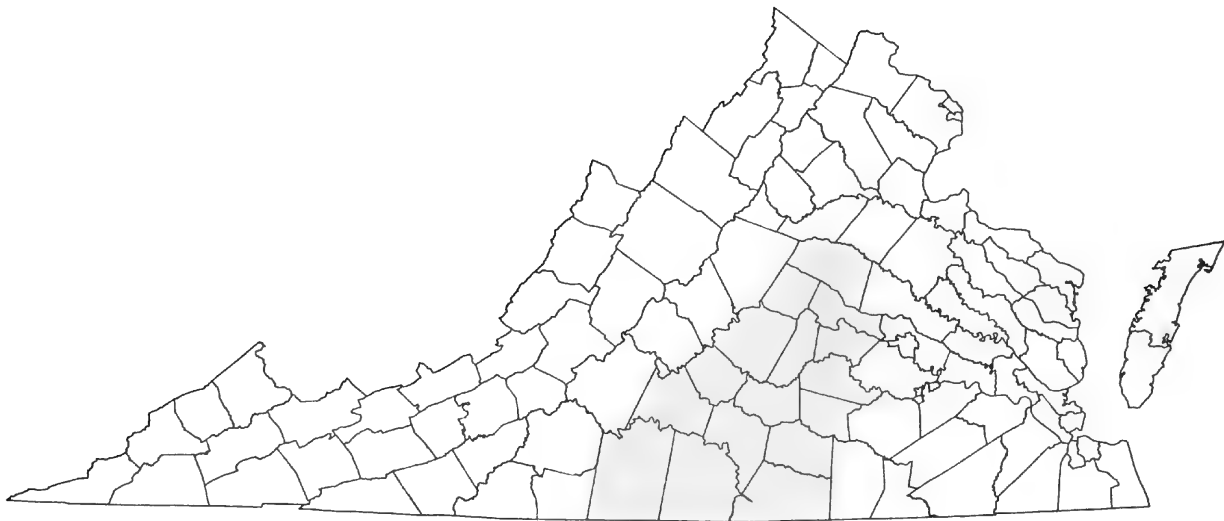


Fig. 3. Counties included in study area (shaded) showing location in Piedmont region of Virginia.

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CHECKLIST OF VIRGINIA PIEDMONT MOSSES

Amblystegium (Amblystegiaceae)
serpens (Hedw.) BSG
varium (Hedw.) Lindb.

Anacamptodon (Fabroniaceae)
splachnoides (Brid.) Brid.

Andreaea (Andreaeaceae)
rupestris Hedw.

Anomodon (Thuidiaceae)
attenuatus (Hedw.) Hueb.
minor (Hedw.) Furnr.
rostratus (Hedw.) Schimp.
viticulosus (Hedw.) Hook. & Tayl.

Aphanorhagma (Funariaceae)
serratum (W.J. Hook. & Wils. ex Drumm.) Sull.

Astomum (Pottiaceae)
muhlenbergianum (Sw.) Grout

Atrichum (Polytrichaceae)
angustatum (Brid.) BSG

undulatum (Hedw.) P. Beauv.

Aulacomnium (Aulacomniaceae)
heterostichum (Hedw.) BSG
palustre (Hedw.) Schwaegr.

Bartramia (Bartramiaceae)
pomiformis Hedw.

Brachythecium (Brachytheciaceae)
acuminatum (Hedw.) Aust.
oxycladon (Brid.) Jaeg. & Sauerb.
plumosum (Hedw.) BSG
rivulare BSG
rutabulum (Hedw.) BSG
salebrosum (Web. & Mohr) BSG

Brotherella (Sematophyllaceae)
recurvans (Michx.) Fleisch.

Bruchia (Dicranaceae)
drummondii Hampe ex E.G. Britt.
flexuosa (Sw. ex Schwaegr.) C. Muell.

Bryhnia (Brachytheciaceae)
graminicolor (Brid.) Grout
novae-angliae (Sull. & Lesq. ex Sull.) Grout

Bryoandersonia (Brachytheciaceae)
illecebra (Hedw.) Robins.

Bryohaplocladium (Leskeaceae)
microphyllum (Hedw.) Wat. & Iwats.
virginianum (Brid.) Wat. & Iwats.

Bryum (Bryaceae)
argenteum Hedw.
caespiticum Hedw.
capillare Hedw.
creberrimum Tayl.
pseudotriquetrum (Hedw.) Gaertn.,
Meyer & Scherb.

Buxbaumia (Buxbaumiaceae)
aphylla Hedw.

Campylium (Amblysteriaceae)
chrysophyllum (Brid.) J. Lange
hispidulum (Brid.) Mitt.

Ceratodon (Ditrichaceae)
purpureus (Hedw.) Brid.

Clasmatodon (Fabroniaceae)
parvulus (Hampe) Hook. & Wils. ex Sull.

Climaceum (Climaciaceae)
americanum Brid.

Cryphaea (Cryphaeaceae)
glomerata BSG ex Sull.

Ctenidium (Hypnaceae)
malacodes (Hedw.) Mitt.

Dicranella (Dicranaceae)
heteromalla (Hedw.) Schimp.
varia (Hedw.) Schimp.

Dicranum (Dicranaceae)
flagellare Hedw.
fulvum Hook.
scoparium Hedw.
spurium Hedw.

Diphyscium (Buxbaumiaceae)
foliosum (Hedw.) Mohr

Ditrichum (Ditrichaceae)
lineare (Sw.) Lindb.
pallidum (Hedw.) Hampe
pusillum (Hedw.) Hampe

Drummondia (Orthotrichaceae)
prorepens (Hedw.) E. G. Britt.

Entodon (Entodontaceae)
cladorrhizans (Hedw.) C. Muell.
compressus C. Muell.
seductrix (Hedw.) C. Muell.

Ephemerum (Ephemeraceae)
crassinervium (Schwaegr.) Hampe
serratum (Hedw.) Hampe
spinulosum Bruch & Schimp. ex Schimp.

Eurhynchium (Brachytheciaceae)
hians (Hedw.) Sande Lac.
pulchellum (Hedw.) Jenn.

Fabronia (Fabroniaceae)
ciliaris (Brid.) Brid.

Fissidens (Fissidentaceae)
adanthoides Hedw.
bryoides Hedw.
bushii (Card. & Ther.) Card. & Ther.
cristatus Wils ex Mitt.
fontanus (B. Pyl.) Steud.
osmundoides Hedw.
subbasilaris Hedw.
taxifolius Hedw.

Fontinalis (Fontinalaceae)
dalecarlica BSG
filiformis Sull. & Lesq.
novae-angliae Sull.
sullivantii Lindb.

Forsstroemia (Cryphyaceae)
trichomitria (Hedw.) Lindb.

Funaria (Funariaceae)
flavicans Michx.
hygrometrica Hedw.

Grimmia (Grimmiaceae)
alpicola Hedw.
apocarpa Hedw.
laevigata (Brid.) Brid.

Haplohymenium (Thuidiaceae)
triste (Ces. ex De Not.) Kindb.

Hedwigia (Hedwigiaceae)
ciliata (Hedw.) P. Beauv.

Hygroamblystegium (Amblystegiaceae)
tenax (Hedw.) Jenn.

Hygrohypnum (Amblystegiaceae)
eugyrium (BSG) Loeske

Hypnum (Hypnaceae)
curvifolium Hedw.
fertile Sendtn.
imponens Hedw.
lindbergii Mitt.
pallescens (Hedw.) P. Beauv.

Isopterygium (Hypnaceae)
elegans (Brid.) Lindb.
tenerum (Sw.) Mitt.

- Leptobryum* (Bryaceae)
pyriforme (Hedw.) Wils.
- Leptodictyum* (Amblystegiaceae)
humile (P. Beauv.) Crum
riparium (Hedw.) Warnst.
- Leskea* (Leskeaceae)
gracilescens Hedw.
obscura Hedw.
polycarpa Hedw.
- Leucobryum* (Leucobryaceae)
albidum (Brid.) Lindb.
glaucum (Hedw.) Angstr. ex Fries
- Leucodon* (Leucodontaceae)
brachypus Brid.
julaceus (Hedw.) Sull.
- Lindbergia* (Leskeaceae)
brachyptera (Mitt.) Kindb.
- Mnium* (Mniaceae)
affine Bland. var. *ciliare* C. Muell.
cuspidatum Hedw.
hornum Hedw.
medium BSG
punctatum Hedw. var. *punctatum*
punctatum Hedw. var. *elatum* Schimp.
stellare Hedw.
- Orthotrichum* (Orthotrichaceae)
ohioense Sull. & Lesq. ex Aust.
pumilum Sw.
pusillum Mitt.
stellatum Brid.
strangulatum P. Beauv.
- Paraleucobryum* (Dicranaceae)
longifolium (Hedw.) Loeske
- Philonotis* (Bartramaceae)
fontana (Hedw.) Brid.
marchica (Hedw.) Brid.
muhlenbergii (Schwaegr.) Brid.
- Physcomitrium* (Funariaceae)
pyriforme (Hedw.) Hampe
- Plagiothecium* (Plagiotheciaceae)
cavifolium (Brid.) Iwats.
denticulatum (Hedw.) BSG
- Platydictya* (Amblystegiaceae)
subtile (Hedw.) Crum
- Platygyrium* (Hypnaceae)
repens (Brid.) BSG
- Pleuridium* (Ditrichaceae)
subulatum (Hedw.) Raben.
- Pleurozium* (Entodontaceae)
schreberi (Brid.) Mitt.
- Pogonatum* (Polytrichaceae)
brachyphyllum (Michx.) P. Beauv.
pensilvanicum (Hedw.) P. Beauv.
- Pohlia* (Bryaceae)
annotina (Hedw.) Lindb.
nutans (Hedw.) Lindb.
- Polytrichum* (Polytrichaceae)
commune Hedw.
juniperinum Hedw.
ohioense Ren. & Card.
- Ptychomitrium* (Ptychomitriaceae)
drummondii (Wils.) Sull.
incurvatum (Schwaegr.) Spruce
- Pylaisiella* (Hypnaceae)
intricata (Hedw.) Grout
selwynii (Kindb.) Crum, Steere & Anders.
- Rhodobryum* (Bryaceae)
ontariense (Kindb.) Par. in Lindb.
- Schwetschkeopsis* (Fabroniaceae)
fabronia (Schwaegr.) Broth.
- Sciaromium* (Amblystegiaceae)
lescurei (Sull.) Broth.
- Sematophyllum* (Sematophyllaceae)
adnatum (Michx.) E. G. Britt.
demissum (Wils.) Mitt.

Sphagnum (Sphagnaceae)
 affine Ren. & Card.
 compactum DC ex Lam. & DC
 henryense Warnst.
 lescurei Sull.
 palustre L.
 subsecundum Nees ex Sturm.

Steerecleus (Brachytheciaceae)
 serrulatum (Hedw.) Robins.

Taxiphyllum (Hypnaceae)
 taxirameum (Mitt.) Fleisch.

Thamnobryum (Neckeraceae)
 alleganiense (C.M.) Nieuwl.

Thelia (Theliaceae)
 asprella Sull.
 hirtella (Hedw.) Sull.
 lescurei Sull.

Thuidium (Thuidiaceae)
 delicatulum (Hedw.) BSG
 recognitum (Hedw.) Lindb.

Tortella (Pottiaceae)
 humilis (Hedw.) Jenn.
 tortuosa (Hedw.) Limpr.

Tortula (Pottiaceae)
 muralis Hedw.
 pagorum (Milde) De Not.

Trematodon (Dicranaceae)
 longicollis Michx.

Ulota (Orthotrichaceae)
 crispa (Hedw.) Brid.
 hutchinsiae (Sm.) Hamm.

Weissia (Pottiaceae)
 controversa Hedw.

Miscellanea

Reports

1. President's Report

The minutes of the December Council meeting are included in this volume. At that meeting, we discussed two important points: (1) *Banisteria* needs more manuscripts, and (2) the VNHS needs to increase membership. To this end, we decided not to raise membership dues this year, but to add postage to back issue orders. We also agreed to support the 2003 BioBlitz that will take place in Douthat State Park in Bath County (see Council minutes below).

Everyone should try to bring at least one new member to the Society this year, and those at institutions whose libraries don't have a subscription should request that they subscribe. Those of us who haven't been submitting manuscripts could make an effort to do so this year.

We experienced a decline in membership from 2000 to 2001 but the number for 2002 was similar to that in 2001. Thus, we continue to have fewer members than we desire. We need a minimal number so that we can continue to produce our journal. Remember that your dues go primarily to support publication of *Banisteria*. If you have not already done so, get that check in the mail to renew your membership. Members will note in upcoming issues that the number of pages is lower than some past issues. This is entirely due to budget constraints. Please support the VNHS by sending dues early and by contributing donations.

During the past year we searched for a new webmaster and found one in John White who has done a great job. Please check out our website at <http://fwie.fw.vt.edu/vnhs/>.

The 10th Annual Joint Meeting of the Virginia Natural History Society and Natural History and Biodiversity Section of the Virginia Academy of Science is scheduled for 29 May 2003 at the University of Virginia.

Respectfully submitted,
Barbara Abraham, VNHS President

2. Council Meeting Minutes

The Elected Council of the VNHS was held at Hampden-Sydney College on December 14, 2002. Council members in attendance were Barbara Abraham, Steve Roble, Joe Mitchell, Dick Neves, Michael Kosztarab, Richard Hoffman, Werner Wieland, and Anne Lund. Werner Wieland, Society president, presided. The minutes of the December 1, 2001 Council meeting were adopted as presented.

The president gave a brief VAS report in terms of the Society's participation. He reported that 143 papers had been presented since the Natural History and Biodiversity section was established in 1994.

The secretary/treasurer reported a membership of 158, with a balance on hand, as of November 30, 2002, of \$4835.54. Membership lists were circulated for council members to gather information and to correct any errors.

The editors reported that *Banisteria* #20 will be 60-70 pages and would go to press soon. The next issue (#21) will contain a large paper on mosses by a deceased naturalist, David Breil. Associate Editor Tom Wieboldt is getting this paper ready for publication. It was decided that the mailing charges for back issues would be in addition to the \$7.50 per copy of the journal. (This change in rates of postage for back issues would be printed in the new brochure for the Society.) It was decided that an upcoming issue of *Banisteria* would include a listing of the publication dates of all previous *Banisteria* numbers. The publication date of *Banisteria* #19 will appear on the inside front cover of #20, and this practice will be continued in future issues.

Old Business included a discussion of the website for the Society. John White, the current webmaster for the Virginia Herpetological Society, will take over the website management, and this will be coordinated through Steve Roble. For his service to the Society, John White will receive a *gratis* membership. It was agreed that there was no need to change the by-laws of the Society with reference to the terms of office for the councilors.

New Business included a discussion of BioBlitz 2003. It was decided that the Society would contribute

\$500 to the effort for the year. Through *Banisteria* and the website, naturalists throughout the State would be encouraged to participate. The dates for the BioBlitz were announced as May 17-18, with Art Evans being the major organizer. It is expected that 50 to 75 naturalists will participate.

Under New Business, membership recruitment was discussed. Steve Roble would make changes in the Society flier and pass the new flier on to the secretary. Archive copies of *Banisteria* are available at Hampden-Sydney College, and the Council requested an inventory of the back issues of the journal.

There was a discussion of changes for membership dues. It was decided that the membership dues would remain the same for another year.

Candidates for Vice President/President Elect and Councilor were discussed. The election ballot needs to be prepared before the publication of *Banisteria* #20. Mike Donahue and Janet Reid have agreed to be candidates for Councilor. Several names were suggested as possible candidates for Vice President/President Elect. Joe Mitchell and Barbara Abraham agreed to contact those individuals about their willingness to serve in this capacity.

There was a discussion of changing the meeting time of the Council from early December to before Thanksgiving. The time of the Council meeting for 2003 was tentatively set for November 15, pending final confirmation by President Barbara Abraham after further consultation with the council members.

Respectfully submitted,
Anne Lund, Secretary/Treasurer

3. Secretary/Treasurer's Report

As of April 2003 we have 122 members, 11 of which are institutions or libraries. These are both new and renewed memberships for 2003. This is a rather good response from our mailing about renewal of membership that was packaged with the 2nd journal for 2002. At the end of 2002, we had 162 members.

As always, we encourage our active members to recruit members for the Society. A membership form is included with this mailing. Pass it on to a friend or colleague interested in the natural history of our state. Some of you will be receiving this issue without having paid your membership for 2003. Please respond to the renewal.

Our treasury presently holds \$6031.66 (as of March 31, 2003). This includes \$1250 that we are holding for the Bioblitz (we have accepted the responsibility of serving as treasurer for that event). We will contribute \$500 towards the Bioblitz from our own funds, as well. And we will pay for the printing and mailing costs of this issue of *Banisteria* from these funds. This leaves \$4281.66 to cover costs of two issues of *Banisteria* with only a relatively small amount left over for the following year and any other unexpected expenses.

We are always grateful for contributions from Society members above the regular membership amounts, and we have received twelve such donations this year so far, totaling \$375. In addition, we have two patrons and three supporting members.

We continue to be grateful to Hampden-Sydney College for support with the paperwork concerning our treasury. The secretary of Gilmer Hall, Hampden-Sydney College, Beckie Smith, has done a fine job of keeping our records of membership, and she has prepared the address labels for all mailings. We thank her for her dedication to these tasks, and we thank the College for supplying this support to the Society.

The recent VNHS election resulted in the election of Judy Winston as President-elect (Virginia Museum of Natural History) and Mike Donahue as Councilor (George Washington and Jefferson National Forests). We welcome these new officers and look forward to working with them.

Please submit all enquiries about membership in the Society or about past issues of *Banisteria* to: Dr. Anne Lund, Virginia Natural History Society, Box 62, Hampden-Sydney, Virginia 23943, or email, alund@hsc.edu.

Respectfully submitted,
Anne Lund, Secretary/Treasurer

4. Editors' Report

The current issue of *Banisteria* (21) contains a single paper on the mosses of the Virginia Piedmont by the late David Breil. We are indebted to Tom Wieboldt of Virginia Tech for taking the lead on this paper and this issue. Tom did it all in PageMaker this time. We know it was a challenge but he rose to it and made it work. Readers will also note that this issue has somewhat fewer pages than previous issues. This trend will continue for the foreseeable future or until

the VNHS obtains enough financial support to allow us to have larger issues again. Part of the concern is printing cost; we simply are not currently bringing in enough money to allow 70-80 page issues. Unfortunately, this has other consequences. For the first time we are holding over manuscripts we have on hand for the next issue. We cannot say with certainty that we will be able to accommodate every paper we have in a forthcoming issue, something we have done thus far. Some accepted manuscripts may be held over for the following issue. We do not anticipate, however, that this will create a long submission-to-publication time as seen in many of the mainstream journals. Thus, we continue to wish for manuscripts and add our plea to that of President Abraham (see above). The Spring 2003 issue of *Banisteria* (Number 21) should be published close to our intended schedule of mid-Spring and mid-Fall. We have several manuscripts in review, most of which should appear in the next issue.

The following list includes the official dates of publication for *Banisteria* issues 1-20. We thank Anne Lund for her help with this compilation.

1. 13 November 1992
2. 28 October 1993
3. 26 April 1994
4. 15 October 1994
5. 28 April 1995
6. 15 December 1995
7. 10 May 1996
8. 27 December 1996
9. 5 June 1997
10. 1 January 1998
11. 15 July 1998
12. 13 January 1999
13. 30 July 1999
14. 4 February 2000
15. 23 September 2000
16. 28 February 2001
17. 24 September 2001
18. 18 March 2002
19. 12 September 2002
20. 21 February 2003

Respectfully submitted,
Joe Mitchell and Steve Roble, Co-editors

The Virginia Natural History Society Application for Membership

Name _____

Address _____

Zip Code _____

Phone _____

Area of Interest _____

Email _____

ANNUAL DUES AND SUBSCRIPTIONS TO BANISTERIA

(all memberships and subscriptions
are by calendar year)

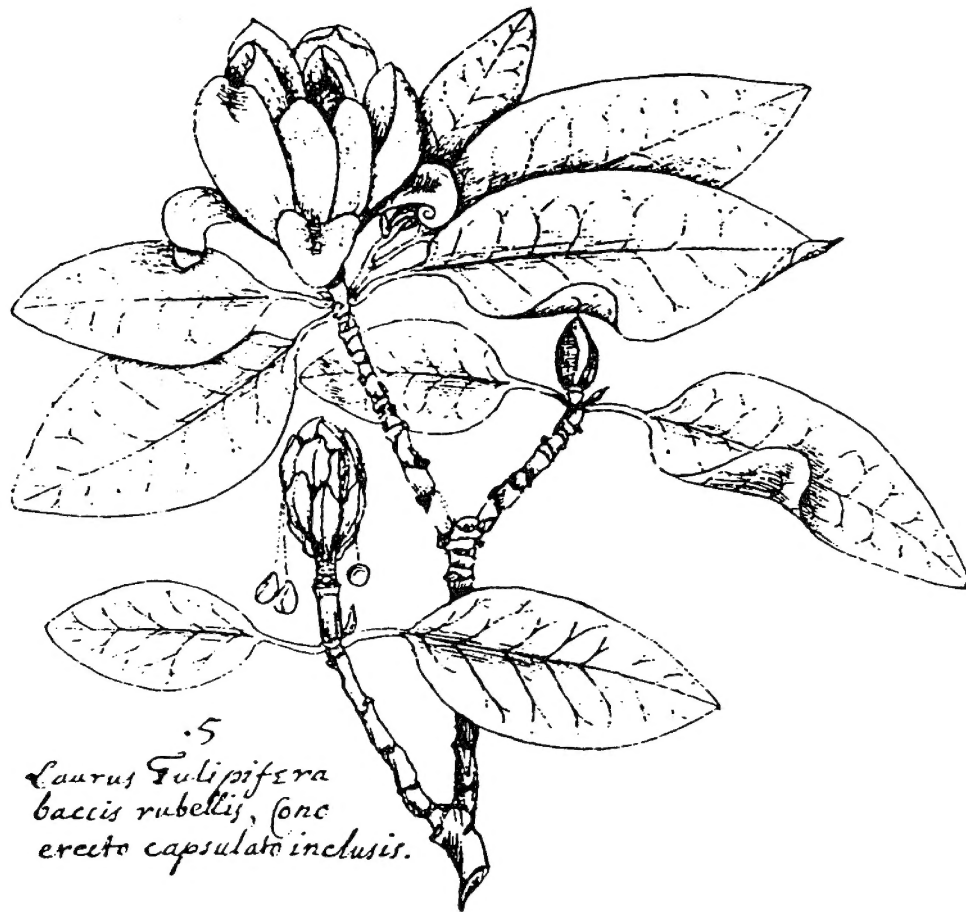
- ☐ \$500.00 Life (not annual)
- ☐ \$300.00 Benefactor
- ☐ \$100.00 Patron
- ☐ \$50.00 Supporting
- ☐ \$30.00 Institutional
- ☐ \$20.00 Family
- ☐ \$15.00 Regular
- ☐ \$5.00 Student (see below)
- ☐ I have added a contribution of \$ _____
to my membership dues.

The special student rate is applicable only when
accompanied by the following certification
signed by a faculty advisor.

Institution _____

Advisor _____

Date _____



Magnolia virginiana Linnaeus

Original drawing by John Banister, sent to Bishop D. H. Compton in 1689.
 Figure 90 in folio in Sir Hans Sloane's MS 4002 in the British Museum.
 Photocopy courtesy of Joseph and Nesta Ewan.

